THE

physical therapy

REVIEW

Volume 34 - Number 12 December 1954

Symposium

Rehabilitation of the Brain-Injured

Introduction — TREANOR

Restitution of Movement Following Brain Injury — TREANOR

Patterns of Restitution of Motor Functions — TREANOR and PSAKI

Selective Reeducation and the Use of Assistive Devices — TREANOR, COLE and DABATO

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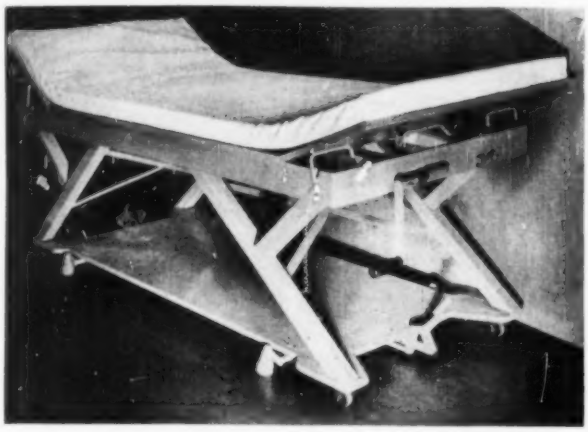

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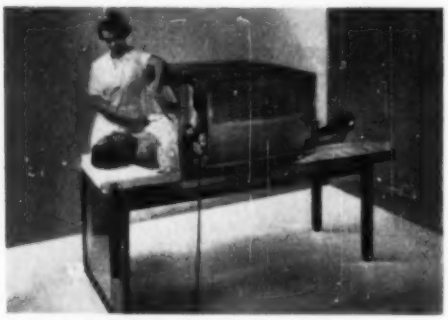

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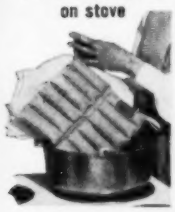

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On September 4, 1954, at the Statler Hotel, Washington, D. C., it was my privilege to again sponsor the Third Annual Institute of Ultrasonics in Medicine. There were 534 registrants including a few PT's. Fifteen stimulating papers were given by Physicians including reports from Neuro and Orthopedic Surgeons, Physiatrists, Medical Men from the Army and VA Services. The eminent William Bierman, M.D., served as General Chairman. The revered Disraeli Kobak, M.D., presented an exciting Presidential address. Cortez F. Enloe, Jr., M.D., Research Consultant to the Pharmaceutical Industry, as luncheon guest speaker gave a thought provoking paper, "Research: A Crutch Or A Guide."

Editor Bouman has planned to print all papers of the Institute in the American Journal of Physical Medicine. I have a few copies of the original program of this meeting. The program contains abstracts of each paper presented, together with data on each speaker. If you would like a copy, it is yours for the asking. Drop me a post card and I'll mail a copy to you.

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The Physical Therapy Review

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Vol. 34 December 1954 Number 12

SYMPOSIUM

Rehabilitation of the Brain-Injured*

Walter J. Treanor, Capt., MC

Introduction

For the purposes of these communications, we have chosen to define the goal of the physical therapist in the rehabilitation of the brain-injured as a restitution of sensorimotor function to that level which is compatible with the existing organic deficits. It follows, therefore, that the goal with certain patients will be an extremely limited one, and that it will be full functional recovery in others. The aim of this investigation was to determine whether there was any consistency in the patterns of spontaneous sensorimotor recovery following brain damage. Hence, a wide variety of etiologic factors was studied in the belief that long tract interruption, from whatever cause, should be followed by a graduated pattern of restitution. Deliberately, the emphasis in these reports has been given to muscle paresis rather than to spasticity. There already exists a wealth of reports on largely unrewarding investigations of surgical and pharmacologic treatment of spasticity. These investigations, and some original methods of aiding relaxation of spastic muscles, have been summarized in a recent comprehensive communication by Levine and others. Their report of the increased relaxation of spasticity that followed active resistive exercise would seem to corroborate Twitchell's findings that the signs of spasticity were greatly reduced following restitution of volitional movement.

Only those residuals of brain damage, whose amelioration falls properly within the competence of the physical therapist, have been studied closely. No thorough assessment of intellectual or speech deficits has been attempted. Deliberate exclusion of patients suffering from primary cerebellar damage, from athetosis, tremors, and rigidities, was decided on mainly because of the lack of success we have experienced in the reversal, by physical therapy, of these disabilities. Broadly speaking, this investigation is no more than an attempt to apply Twitchell's methods of careful observation to the mosaic of muscle recovery in the lower extremity. Only those observations which differ from, or add to, his findings on the process of recovery in the arm, are recorded. An outline of a carefully timed physical therapy program is advanced in support of his advocacy of "proprioceptive and contactual exercises in the retraining of movement."

* The three papers that follow, which make up the Symposium, were read at the Annual Conference of the American Physical Therapy Association, Los Angeles, June 1954.

The authors wish to make grateful acknowledgement of the technical assistance they received throughout from M/Sgt. Carus Hicks.

Restitution of Movement Following Brain Injury

Walter J. Treanor, Capt., MC

Much of presently accepted methods of physical treatment of the muscle paresis following brain damage is based on empiricism. This is apparent from Dinken's report of a "lack of knowledge relative to the factors which influence recovery (in hemiplegia)." In attempting to reexamine the rationale for, and the value of, these methods in the rehabilitation of brain-injured patients, we propose to review the literature dealing with the altered physiology found in upper motor neuron diseases. As is usual in the discussion of any neurologic deficit, reference must first be made to the contribution which Hughlings Jackson made to our understanding of this particular form of organic damage. Jackson propounded the theory of release from higher control, and described the residual paresis as "evolution not being entirely reversed, some level of evolution is left." The patient following brain damage became "reduced to a lower level of evolution." Denny Brown has described the disintegration of motor functions in progressive frontal lobe lesions as a "release of certain cortical motor automatisms from their natural integration with total behavior." For common convenience, the peripheral manifestations of brain damage have been summarized under the heading of spasticity and of muscle paresis. The first of these, spasticity, Walshe has referred to as identical with the exaggeration of postural reflexes seen in decerebrate rigidity. Its individual components of hyper-reflexia; hypertonus, associated with increased resistance to stretch; clasp-knife phenomenon; associated movements; and clonus, are so well known that they need no more than mere enumeration in this report. They are merely reflections of a state of hyperexcitability prevailing at the spinal level, due in large measure to the reduced down-flow of inhibitory impulses.

Hypertonus in postural muscles

Wagley found a selective distribution of hypertonus following section of extrapyramidal fibers in the lateral funiculus of the cord of Macaque monkeys. This hypertonus was seen in the protractors, adductors, and internal rotators of the hip, in the extensors of the knee and in the plantar flexors and invertors of the foot. In human beings, following cerebral apoplexy, Walshe outlined a somewhat similar distribution, with "the arm in an attitude of flexion and adduction, the leg extended and externally rotated, with plantar flexion of the foot." In the child with brain damage which produced spastic paralysis of the limbs, Perlstein reported the assumption of a similar attitude in the legs during supported stance. The knees were held in rigid extension and the ankle in equinus, while the hips were fixed in extension, internal rotation, and adduction. These separate components of a flexed upper extremity and of an adducted extended lower extremity have repeatedly been ascribed to functional over-activity in postural (antigravity) muscles. Likewise, following experimental long tract interruption, Wagley found a delayed return of volitional control of flexor muscles in the leg. The monkeys never used an involved foot for scratching; eversion of the ankle was never seen; dorsiflexion was observed only during excitement.

That the triceps surae, quadriceps, and hip adductors are postural muscles is apparent to everyone. These are the groups whose destruction would naturally lead to an inability to maintain the erect attitude. A description of the flexor muscles of the arm as antigravity muscles, however, is not at once so apparent. Russell Brain has added much to our knowledge of the function of the arm at this "lower level of evolution." He has pointed out the resemblance between the posture of the human arm in hemiplegia and the normal resting posture of the forelimbs of the anthropoid apes. The resting attitude of the monkey's arm was seen to be one of shoulder adduction and internal rotation, flexion at the elbow, pronation and flexion of the forearm and wrist, metacarpophalangeal, and interphalangeal joints. Brain pointed out, moreover, that the hemiplegic resting attitude was not similar to the fetal attitude. Exaggerated leg extension,

Assistant Chief, Physical Medicine Service, Letterman Army Hospital, San Francisco.

such as is seen in adult hemiplegia, was not a part of the fetal attitude.

It becomes necessary, at this stage, to refer to the difficulties that arise from attempts to correlate experimental findings on decorticate or "spinal" quadrupeds with clinical observations on spastic paresis in higher primates. In quadrupeds, the terms extensor and postural, as applied to muscle groups, are readily interchangeable. Such a generalization certainly is not true for man in whom the extensors of the arm do not have any function of resisting the force of gravity. Postural muscles in man, therefore, can be redefined as the extensors of the legs and the flexors of the arms. Restitution of either reflex or volitional response has been found to occur much earlier in these muscles than in their antagonists. The mechanisms by which spinal reflex centers are thus "pre-set" in favor of postural muscle groups must now be explored.

1. *Afferent fibers*

Nervous energy is ultimately derived from afferent discharge.

Motor activity, the resultant of a detonator action of impinging afferent impulses on spinal motor centers, can be suitably modified "in relation to the algebraic sum of opposed afferent influences." In an excellent review article, Lloyd has discussed some physical differences seen in afferent relays of lower vertebrates. Afferent fibers transmitting postural reflexes were large in diameter and had conduction velocities as high as 116 meters per second. Their arborizations around anterior horn cells were direct, and the entire reflex circuit was commonly composed of only two neurons. On the other hand, afferent fibers subserving flexor reflexes commonly were characterized by smallness in diameter, and their synaptic connections were much more complicated. Since it is apparent that the ultimate response of the motor neuron must depend on the complexity of arborization and on the rate of arrival of afferent stimuli from end organs, it is conceivable that there is a predisposition towards postural activity, even in the nature of the afferent fibers themselves.

2. *Flexor and extensor spinal reflexes*

Differences also have been pointed out as occurring between flexor and extensor reflexes. Flexor reflexes have been extensively studied by the Oxford School. Sherrington himself described the flexor reflex as being "prepotent," as displacing all other afferent messages from anterior horn cells (Selected Writings). Fulton discussed the flexor withdrawal during peritoneal irritation as an illustration of the primeval pattern of flexion response of higher vertebrates. Traction of the arm and contactual stimuli applied to the palms of the hand have been found by Twitchell to produce increased flexion of the arm.

Lindsley has compared the marked exaggeration of stretch reflexes in antigravity muscles of the decerebrate cat to "that observed in comparable states of myotatic hyper-reflexia in man." Contactual stimuli to the soles of the feet have been shown to be capable of inducing, or exaggerating, this "extensor thrust" through activation of stretch reflexes and of the Stutz mechanism. This latter reaction has been ascribed to the occurrence, following plantar stimulation, of simultaneous contraction in postural muscles and in their antagonists. During slowly developing lesions of the cord, extensor reflexes were seen by Cairns and Fulton to predominate right until the pyramidal or vestibulospinal tracts were completely destroyed.

3. *Selective synaptic resistance*

Coordination, or to use Sherrington's term, compounding of reflexes, has been shown to derive in part from the existence of selective resistance at spinal synapses. Sherrington has described this: "whereas between its own afferent root fibers and some of the motoneurons of the segment, connection is facile, resistance low, between its afferents and other of its motoneurons, connection is difficult, resistance high." This hypothesis of selective synaptic resistance has been expressed most simply in terms of competing half centers, one innervating flexor muscles, and the other extensor muscles. Such an anatomical arrangement has been shown to exist in the grouping of anterior horn cells in the cervical and the lumbar enlargements of the cord. Here it is possible to divide the cells innervating the muscles of the extremities into a dorsal flexor group and a ventral extensor group. Incoming proprioceptive fibers ramify directly (at the same segmental level), with cells innervating the extensors. Their branches to higher and lower levels do not extend quite so far ventrad, and end in the neighborhood of flexor neurons. Exteroceptive, particularly pain-carrying, fibers are relayed to cells of the flexor group. The balancing of these opposing afferents into purposeful reflex activity has been likened to the "feed-back mechanism" seen in the governor of a steam engine. Higher centers have been shown to exert influence on the final common pathway through their abil-

ity to change the "gain" (amplification) in such feed-back mechanisms.

4. *Corticospinal relays*

It is no longer customary to assign exclusive functions to punctuate areas of the motor cortex, or to accentuate morphological and functional differences between a "motor," as opposed to a "premotor," cortex. The concept that the large cells in these areas were the "great initiators of movement" has been largely replaced by the jacksonian hypothesis of a sensorimotor cortex, in which these cells serve as interneurons for the relaying of afferent impulses from the spinal cord, from subcortical centers, and from adjacent areas of the cortex itself. Activation of the final common pathway has been shown to depend on the harmonious functioning of cortical elements of varying complexity. Marion Hines has shown a close relationship between the developing structure of the Macaque monkey's cerebral cortex and the phylogenetic pattern of motor development. When areas 4 and 6 (Brodmann) were poorly developed, she found tonic innervation of flexors and their related groups in upper and lower extremities. Later, with beginning formation of areas 4S and 6, spasticity became apparent, associated with an ability to initiate movement at proximal joints. Following maturation of pyramidal pathways, and of extrapyramidal pathways arising in front of area 4, she observed free play between flexor and extensor activities, and noted the monkey's ability to perform discrete movements of distal muscles.

Much controversy has existed about the role played by damage to pyramidal and extrapyramidal projections in the production of muscle paresis. Sarah Tower has reported that a lesion in area 4 produced a flaccid paralysis. Following section of the pyramidal tract in the monkey, she observed that the animal developed a nonspastic paresis which was confined mainly to hand and foot muscles. Proximal limb muscles, at the same time, developed only a simple hypotonia. Brookhart reported that the larger fibers of the pyramidal system were distributed more commonly to interneuron pools related to motoneurons controlling distal limb muscles. Motoneurons controlling proximal muscles were seen to be much less easily excited by impulses from these large fibers of the pyramidal system.

More recently emphasis has shifted to the importance of extrapyramidal lesions in the production of spastic paresis. It is no longer customary, as has been pointed out by Russell Meyers, to view the extrapyramidal system as being entirely subcortical. At present, neocortical components, and their related corticofugal fibers, are generally viewed as integral to the extrapyramidal system. It is common indeed to describe this system as a "complicated servomechanism for the control of the final common pathway." Magoun and Rhines have described its projections, especially those of the reticulospinal system, as closely associated with proximal muscles important in posture and progression. Also the extrapyramidal system, again particularly the reticulospinal portion of it, has been shown to exercise control on any fixation of the part which accompanies the initiation and execution of refined phasic activity. The servomechanism has been described as "setting the stage" for refined movements, executed through the mediation of pyramidal projections. Work by Magoun and his many collaborators has emphasized the inhibitory influence exerted by extrapyramidal pathways on lower motoneuron circuits. Withdrawal of their inhibitory effect was manifested chiefly as over activity of antigravity muscles.

There is accumulating evidence that ipsilateral relays from the cortex exert a definite influence on anterior horn cells. Of particular interest in this regard has been the report by Penfield and Welch of a "supplementary motor cortex" on the medial surface of the cerebral hemisphere. Following hemispherectomy for infantile spastic hemiplegia, Bates observed the muscular response to stimulation of the medial surface of the intact hemisphere. He found that "half the excitable points on the medial surface gave movements commencing in the contralateral leg; the remainder gave movements commencing with the ipsilateral (hemiplegic) leg, the contralateral arm, and the ipsilateral arm in this order."

5. *Proprioceptive reflexes*

Tonic neck reflexes have been studied by Bobotha and Bobotha, and separately by Lajoie and Gersten, but in no instance has any proof been adduced that the use of these reflexes is of any sustained benefit in the retraining of muscles. Perlstein has shown that the tonic neck reflexes did not persist beyond the sixteenth week in normal child development. When brain damage was severe, they could persist into adult life.

Brain and Twitchell have demonstrated that alterations in the distribution of hypertonus coincided with changes in the position of the hemiplegic arm (labyrinthine reflex); thus, flexor hypertonus became accentuated when patients

were placed in the side-lying position, with the hemiplegic arm uppermost. With the paretic arm underneath the body, inhibition of flexor reflex activity was at once apparent, and the arm could be extended passively at the elbow joint. Brain also observed a differential distribution of hypertonus in man when the arm was used as a support, such as in quadruped walking. When the body was bent forward at the hips to the point where balance was sufficiently disturbed, a previously hypertonically flexed arm could be seen to go into rigid extension.

Of greater interest to the physical therapist have been the few reports on differences observed in the amplitude of reflex and volitional activity following changes in the position of individual joints. These have shown that the amount of reflex and volitional motor return could be determined more readily when the paretic muscles were tested in the antigravity position. Alterations in the distribution of hypertonus and subsequent contracture have been observed following interruption of corticospinal and extrapyramidal tracts. Wagley, and also Marion Hines, found that the muscles with the most contracture were not always those which had shown the greatest amount of hypertonus. The finding of contractures in previously hypotonic knee flexors was attributed to the common postural attitudes assumed by the monkeys during convalescence. A somewhat similar mutation has been described by Perlstein in his study of cerebral palsied children. Thus the rigid extension, seen in both hips and knees in the early disease, was found in the later stages to yield to knee and hip flexion contractures. Perlstein attributed these changes to the prolonged "knee-sitting position" often assumed in the first year or two of life.

Such a distribution of contracture about the hip and knee joint with concomitant plantar flexion of the ankles, we have chosen to describe as the "paradoxical attitude." The paradox lies in the existence of hypertonus and contracture concurrently in antigravity muscles such as the hip adductors and ankle plantar flexors and in the flexor muscles of the hip and knee joints. Where this distribution has been observed in the lower limb of adult hemiplegic patients, it has been commonly ascribed to the absence of the positive supporting mechanism during prolonged recumbency. It has been pointed out that this shift in hypertonus was frequently dependent on the position in which the second joints (knee and elbow) were maintained during convalescence. This hypothesis, advanced by many authors* of a plasticity in the distribution of hypertonus and contracture has not received the thorough study it would seem to merit. If such reversibility of tonus does in fact exist, then continued positioning of the limb during the phase of returning tonus may offer an additional means for central and selective facilitation of volitional movement.

* See references 26, 27 and 28.

6. *Sensory deficits*

That there was early recognition of the sensory deficits following brain injury is obvious from a report by Robert Boyle, in 1691, of a young man who had sustained a depressed fracture of the skull. Boyle described the patient as having a dead palsy of his right arm and leg, with extremities that were sensitive to pin prick, but which had lost their sense of position. Diminished position sense is seen also when capsular hemorrhage or thrombosis extends posterior to the "leg" area in the internal capsule. Gross impairment of motor function has likewise been shown by Sherrington (1931) to follow experimental deafferentation of a limb, and as a result of damage to fibers conveying proprioceptive impulses, such as occurs in demyelinating diseases.

SUMMARY

In this paper, experimental and clinical evidence has been advanced for the existence of considerable spontaneous restitution of movement following damage to the brain or its relays to spinal motor centers.

Such restitution has been shown to occur in a selective fashion, to appear earliest and most persistently in muscle groups subserving posture. It has been pointed out that there is ample reason for the existence of this selectivity, in the nature of afferent fibers themselves, in the organization of spinal reflexes, and in the modification of reflexes by supraspinal relays.

In a brief discussion of supraspinal relays, it has been pointed out that spastic paresis is as much a product of interruption of extrapyramidal pathways as it is a manifestation of "pyramidal disease."

Recovery, occurring spontaneously in the flexors of the arm and the extensors of the leg, has been likened to that "lesser level of evolution" described by Hughlings Jackson.

Emphasis, throughout, has been on the nature of spontaneous, as opposed to therapeutically-influenced, recovery in muscle function following brain injury.

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Patterns of Restitution of Motor Functions

Walter J. Treanor, Capt., MC, and Raoul C. Psaki, Lt. Col., MC

Patterns of motor recovery were observed in 70 patients who had suffered injury to the brain from a variety of causes. In age, these patients varied from 4 to 89 years, with a distribution according to decades as shown in table I. Weighting of this sample towards the extremes of life was made inevitable by the inclusion of cerebral palsied children on the one hand, and of patients who had suffered cerebrovascular insults on the other. That aging factors, of themselves, have little bearing on the pattern, as opposed to the extent of motor recovery, was borne out by our observations of a similar continuum of motor recovery in another group of 20 middle-aged patients, in whom trauma had been confined to the spinal cord. There were 49 males and 21 females in the series. We observed no consistent differences between the sexes in the rate of reflex or volitional return.

The etiologic factors productive of brain damage have been summarized in table II. Since this is a report on 70 consecutive patients referred to a physical medicine service of a general hospital, it was not surprising that degenerative vascular lesions outnumbered all other etiologic factors. It was not found possible in this study to distinguish with any accuracy between the three main types of vascular pathology, which are productive of capsular damage. However, in no case was capsular hemorrhage suspected clinically. Autopsy examinations were performed on 2 of the 4 patients who died. In each instance, there was such extensive cerebral damage that it was impossible to be certain of either the locus or the type of the original vascular lesion. In 8 other patients, the location of the vascular

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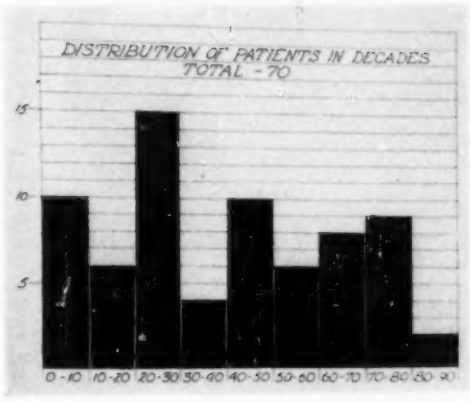
TABLE I



Age distribution in decades.

disease was established by carotid arteriograms. Brain damage, secondary to physical trauma in 10 patients, and as a consequence of tumor resections in 4 other patients, was found to be greatest in the frontal and parietal lobes. Only 4 patients showed gross signs of bilateral involvement.

The patients were divided into four main groups according to the levels of motor recovery which they achieved. In the first group, the pattern of recovery was observed from the stage of generalized hypotonia (flaccidity) to the appearance of gross limb synergies. The next "plateau" in recovery of muscle function was seen to appear when patients were capable of full phasic activity at the knee and elbow joints. The term phasic activity, as used in this report, describes the patient's ability to perform flexion and extension of these joints, through a complete arc of movement, and in all positions of these joints relative to gravity. In a third group of patients, recovery was seen to proceed to the level of restored function of distal muscles. The fourth group comprised those patients who showed complete restitution of motor functions about proximal as well as distal joints (see table III).

Recovery to the level of limb synergies

1. *Postural hypertonus*

In 29 patients, a recovery of motor function did not proceed beyond volitional control of a flexor synergy in the arm and of either a flexor or an extensor synergy in the leg. A state of persistent generalized flaccidity was not observed

TABLE II

FACTORS PRODUCTIVE OF BRAIN INJURY

70 Patients

Thrombosis of the Internal Carotid Artery	4
Aneurysm and Thrombosis Middle Cerebral Artery	4
Cerebral Tumors	4
Demyelinating Diseases	6
Traumatic Encephalopathy	10
CVA—Exact Type Undetermined	29
CP—Location of Damage Undetermined	13

TABLE III

LEVELS OF MOTOR RECOVERY

70 Patients

Gross Limb Synergies	29
Restored Phasic Activity at "Second Joints"	10
Restored Distal Muscle Functions	20
Restored "Fixator" Functions of Proximal Muscles	11

in a single patient, although hypotonia was evident in 1 patient for as long as six weeks after the initial injury. The pattern of an early flexor synergy, or mass movement, in both upper and lower extremities, which had been reported by Twitchell, was also observed in these patients.

In the arm, a gross movement consisting of scapular elevation-shoulder abduction, combined with elbow and wrist flexion, was earliest in appearance. Among the stimuli which "facilitated" this gross movement were the assumption of the erect posture, proprioceptive or contactual stimuli applied to the flexor surface of the arm, and excessive demands on the dexterity of the opposite arm. Each of these factors was found to augment flexor hypertonus, as measured by increased resistance to passive stretch or by increased amplitude of voluntary contraction. The hypertonus was most marked in the shoulder adductors and internal rotators, elbow flexors, pronators of the forearm, palmar flexors of the radiocarpal joint, and flexors of the joints of the fingers and the thumb. We did not observe the extensor synergy in the arm, which Twitchell had reported in his series.

In the leg, a short-lived flexor synergy, consisting of limited hip and knee flexion and foot dorsiflexion in inversion, was succeeded within 7 to 10 days by the appearance of an extensor synergy. This consisted of incomplete extension at the knee joint combined with plantar flexion and inversion of the foot. The rate of appearance of this extensor synergy was directly dependent in all cases on the time at which standing with

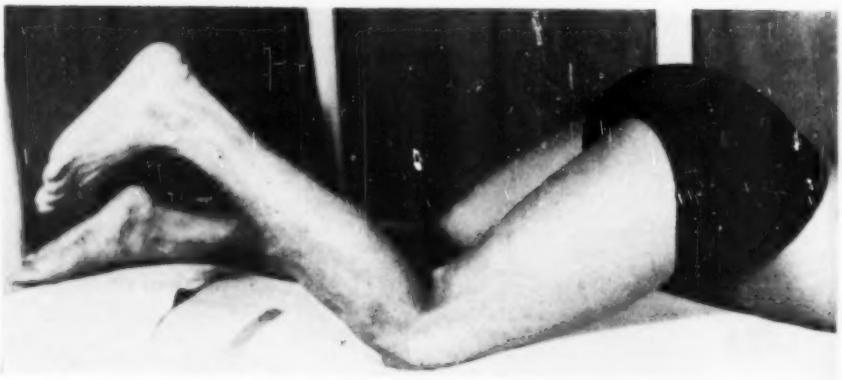


Figure 1. Attempted knee flexion. Note prior hip flexion ("bunching") and ankle dorsiflexion.

support was instituted. In 3 patients, a delay in standing of 4 to 6 weeks was necessitated by concomitant lung disease and by acute thrombophlebitis. Extensor hypertonus developed more slowly, and much less completely, in these patients. Muscles acting on the hip joint were found to be hypotonic, except the hip adductors and internal rotators in 11 of the 13 patients suffering from cerebral palsy.

Quantitative assessment of the degree of the extensor hypertonus was not attempted, and we grew accustomed to differentiating between but two levels of extensor activity. In the first of these, the state of flaccidity had been succeeded by one of hyper-reflexia, but there was still insufficient reflex activation of the quadriceps femoris to permit standing without external splinting of the knee joint. In the second level, standing without external support was possible because of the increased hypertonicity of the knee extensors and plantar flexors. Progression of extensor hyperactivity beyond this level resulted in the appearance of the so-called "hemiplegic gait." Two hemiparetic patients were observed, who had been fitted with long leg braces in another installation for support of "weakened knee extensors." Manual muscle testing showed that the "paretic" quadriceps, in the arc from 160 to 120 degrees, offered greater resistance to stretch than did its fellow of the "normal" (unbraced) side. The ability to flex the knee joint, moreover, had been delayed greatly by the continued wearing of the brace.

One other patient with spastic hemiparesis was first seen by us 14 years after his initial vascular accident. Spontaneous recovery in his case apparently had become arrested permanently at this level of limb synergies. Contracture had occurred in all hypertonic muscle groups, and all save the proximal joints had become fixed by fibrous ankylosis. This patient presented such a caricature of this state of selective return in postural groups that a summary of the initial findings included: "The left knee is fixed at an angle of 160 degrees, the left ankle and midtarsal joints allow only about 10 degrees of total motion from a position of marked equinovarus. The left elbow joint cannot be moved passively from a position midway between flexion and full extension. Contractures in the wrist and finger flexors appear to be irreversible, and the hand has the vasomotor changes seen in a sympathetic dystrophy. The rigidly flexed (indwelling) thumb cannot be extended passively at either the metacarpophalangeal or interphalangeal joints."

2. *Muscular imbalance*

To ascertain whether muscular imbalance was a major factor in the production of this "hemiplegic posture," manual muscular testing was performed on 14 patients at weekly intervals during the early stages of returning hypertonus. Strong resistance to passive stretching of the quadriceps was felt in every patient from about 160 to 90 degrees, and 10 of these patients were able to extend the knee volitionally through this range. No patient showed a comparable degree of resistance to passive stretching of the knee flexors, and only 4 patients exhibited any ability to flex this joint volitionally. With the patient lying prone, we noticed that prior flexion of the hip seemed to be a prerequisite for the initiation of active knee flexion. When this "pelvic bunching" was prevented by pressure on the sacrum,

the amplitude of knee flexion was greatly diminished. Prior dorsiflexion of the foot was also found to be necessary for the initiation of the movement of knee flexion.

Imbalances were also observed in muscles which acted on the foot and ankle joints (see figure 1). Thus, strongly contracting plantar flexors were found to be opposed by only one dorsiflexor muscle, the tibialis anterior. Action of the tibialis anterior, moreover, was detectable only during the performance of total flexion of the limb. The movement of eversion, either from a position of plantar flexion or of dorsiflexion, was never seen at this stage of recovery. Patients presented findings of gross dysfunction of all hip muscles. In fact, the only movement which any patient could perform under willed control, at this stage, was that of hip flexion with the femur in about 30 degrees of external rotation. Clinical reflexion of this ablation of hip muscle functions was seen in the compensated Trendelenburg gait, which was observed as a common finding in 52 of the 70 patients included in this report.

3. *"Paradoxical attitudes"*

In 7 patients under 10 years of age, all of whom had recovered to the level of limb synergies, we observed a "paradoxical attitude" of exaggerated flexion at the hip and knee joints associated with plantar flexion at the ankle (see figure 2). Hyper-reflexia and increased resistance to passive stretch were seen in the hamstrings in all of these patients. In 3, flexor hypertonus had been succeeded by fibrous contracture of the flexor groups of both hip and knee joints. Conversely, the relative hypotonia of the extensor muscles was reflected in an extreme difficulty in activating the quadriceps by any of the usual methods of reinforcement. The equinus deformity at the ankle was rarely found to be irreversible, as most of the patients demonstrated an almost normal range of dorsiflexion following nocioceptive stimulation of the plantar surface of the foot. Ankle equinus in 4 patients was accompanied by overactivity of the invertors of the tarsus, and in the other 3, by hyperactive peronei, longus and brevis.

A somewhat similar pattern of knee and hip flexion contracture was seen in 3 adult patients. Two of these patients had suffered from multiple sclerosis for periods in excess of 20 years. Both of them had lived wheel chair existences for approximately one-half of that time, and neither of them had stood in the five years preceding our initial evaluation. Neither patient had the ability volitionally to extend the knee through a range of more than 15 degrees. Contracture of the posterior calf muscles in both patients had resulted in the production of a fixed equinovarus deformity of the foot. The third was a 73 year old patient, who was nursed inadvertently in a position of acute knee and hip flexion. Seven days after onset of his hemiparesis, hyperactive patellar and achilles reflexes had been elicited. Six weeks later, hypertonicity had shifted to the flexor groups of the hip and knee, but still persisted in the plantar flexors of the ankle. Hamstring reflexes which had been initially graded as absent to a trace were found to be greatly increased in amplitude after six weeks. At this time, fibrous contracture in the hamstrings limited total passive movement in the knee to 30 degrees (from 90 degrees to 120 degrees).

Figure 2. "Paradoxical Attitude."

In summary, all 29 patients were grossly unable to perform full range of free movement at any one joint. Movement occurred only as a gross pattern of flexion or extension synchron-

ously in all the joints of the lower extremity, or as a gross pattern of flexion occurring in all the joints of the upper extremity. Once again it needs to be emphasized that this was the pattern of spontaneous restitution of movement seen in these patients, and that the physical therapy which these patients had received apparently had little effect in altering the distribution of hypertonus and/or contracture. The influence of physical therapy procedures on subsequent stages of recovery was much more in evidence. It is necessary also to point out that all of the 70 patients in this series, at some time in their recovery, went through this stage of gross limb synergies. Comparison can readily be drawn between many features of this state of spontaneous recovery in human beings and the level of recovery seen in higher primates following experimental sections of both pyramidal and parapyramidal pathways.

Restored phasic activity at elbow and knee joints

Recovery in 10 patients was seen to stop at the level of restored phasic activity of the knee and elbow joints. At this stage, the patients were able to perform the gross limb synergies of flexion and extension, but had added to this an ability to flex and extend the second joints through a complete range in all positions relative to gravity.

Flexion at the knee, as already noted, was originally accompanied by flexion at the hip. This we surmised was due to the need for prior stretching of the hamstrings to aid in the initiation of the motion. As strength of the hamstrings increased, patients no longer had to perform this preliminary "bunching of the pelvis." In all patients there was an initial obvious imbalance between strong inner hamstrings and weak biceps femoris. This imbalance became corrected only during late stages of recovery in hamstring function. Knee flexion was also grossly affected by the presence of imbalances between the hip rotators. As a result of this it was necessary, in the preliminary assessment of hamstring function, for the examiner to stabilize the foot in a position midway between internal and external rotation. Prior fixation of the foot in dorsiflexion was also seen to increase the amplitude of hamstring activation. The response of the hamstring muscles to the application of a pain stimulus on the sole of the foot offered an early indication of the amount of flexor return which ultimately could be expected. Recovery in hamstring function was not considered to be complete until the patient showed facility in bending the knees to at least a right angle while in a standing position. Early in recovery this motion was possible only in front of the body. Later, patients demonstrated the ability to flex the knee to a right angle without any accompanying hip flexion. We found that it was only after this had been accomplished that extensor hypertonus no longer interfered with the patient's ability to initiate knee flexion early in the swing phase of gait.

Volitional extension at the elbow through complete range developed after volitional flexion at the knee, and occurred earliest in the arc of motion from 100 degrees to 150 degrees. With increasing relaxation of the biceps brachii, extension finally became complete throughout full range. It was usually performed with the forearm in a semiprone position. Extensor hypertonus was most apparent when resistance to stretch was tested with the patient lying supine, and with the humerus placed in 90 degrees of forward flexion. Likewise, volitional control of this movement was observed much earlier in this position of the arm than in the gravity-eliminated position.

Restoration of function in distal muscle groups

In 20 patients recovery progressed to the level of restored function in distal muscles with persistent impairment of the function of proximal muscles.

1. *Forearm*—Dorsiflexion of the wrist was first seen when resistance was offered to elbow extension or flexion. All patients were capable of an isometric (holding) contraction in the dorsiflexors before they could perform the movement volitionally through any worthwhile range. Isometric and isotonic contractions were seen in the ulnar extensors of the wrist about two weeks before an equal contraction occurred in the radial extensors. Ability to supinate the forearm was late in appearance in every patient, and usually patients had achieved control of alternate movements of the wrist and fingers before they could supinate fully.

2. *Hand*—Gross finger and thumb flexion was the first pattern of movement observed in the hand. The amplitude of this movement was greatly augmented when the patient was standing, or when contractual stimuli were applied to the palm of the hand. Likewise, we observed that most of the common procedures in occupational therapy accentuated this earlier return in the flexor groups. Gross finger flexion was followed by the appearance of incomplete finger extension in all the digits simultaneously. Initially, the range of this movement was always greatest at the metacarpophalangeal joints, and least at the interphalangeal joints. In 2 patients, this ear-

lier return of extrinsic finger extensors had, in a period of two to three months, resulted in hyperextension contractures at the metacarpophalangeal joints. Both patients with hyperextension contractures also showed evidence of "ulnar drifting" at these joints. In one of the patients, faulty positioning had led to a destruction of the first dorsal interosseus muscle by overstretching. Somewhat similar types of substitution and persistent malalinement were observed in the thumb. Because of these, there was commonly a delay of several months before the appearance of volitional control of either the short thumb abductor or extensor muscles. In a few instances, thumb web contractures, and the presence of dorsal subluxation at the metacarpophalangeal joint of the thumb were observed. With further improvement, patients showed an ability to extend at individual joints of the fingers and thumb, and finally could extend each of the fingers individually.

3. *Leg and foot*—Of the distal muscles of the lower extremity, the peroneals were latest in rerecovery. In most patients, their recovery was delayed from six to eight weeks after that of the tibialis anterior. Slowest in appearance was the movement of dorsiflexion in eversion. Even when the peronei, longus and brevis, had been restored to nearly normal strength, there was still a lack of synergy between these muscles and the more dorsally placed evertor muscles. During recovery, "dorsal bunions" were seen as a transitory finding in 5 patients. Despite the early appearance of hypertonus in the plantar flexors of the ankle, there was an unexpected delay in the restoration of voluntary control of these muscles. Thus, when these muscles were tested with the knee fixed in full extension, or when soleus function was tested in the prone position, we were unable to demonstrate any correlation between the strength of willed contraction and the amount of reflex hyperactivity. It appeared that part of this deficit in voluntary power could be attributed to impaired joint sensibility.

Restoration of function in proximal muscles

In 11 patients who had recovered good function in distal muscles, we observed that full recovery of the limb's usefulness had not been achieved. In these patients the muscles of the shoulder and hip were the last to recover. Destruction of fixator muscle function was the most consistent sequela of brain injury in this series of patients, and there was not one patient in whom some evidence of proximal muscle paresis was not demonstrable. According to our knowledge, selective destruction of these muscles has not previously been reported as a common accompaniment of upper motoneuron diseases. The muscles which recovered latest in this group were the serratus anterior, the superior and lower trapezius, the middle fibers of the deltoid and the external rotators of the humerus. Clinically, the paresis was manifested as a "winging" of the scapula, as a "lag" in shoulder elevation, and as an inability to perform pure scapulohumeral abduction beyond 20 to 30 degrees. Three of the patients also showed gross involvement of the middle trapezius and rhomboids. "Winging" of the scapula was most obvious during descent of the arm from a position of forward flexion (see figure 3). Imbalance between relatively strong humeral adductors and weak humeral abductors, and also between internal and external rotators, was present in all of these patients.

Figure 3. "Scapular winging."

The major symptom these patients offered was their "inability to use the hand except when the elbow is resting on something." All of these patients were seen to have good functional use of the hand muscles, and it was apparent that their disability was the consequence of impaired func-

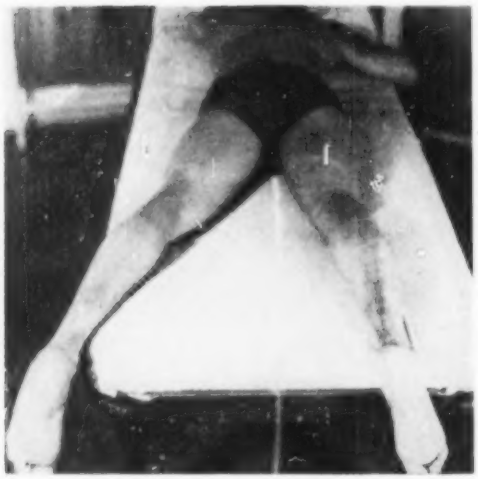


Figure 4. Grossly impaired hip abduction on right.

tion of fixator muscles. Likewise the dysmetria which they exhibited was not of cerebellar origin, but seemed to result from imbalances in these muscle groups. The part that these fixator muscles play in "setting the stage" for fine movements about distal joints has been discussed in an earlier paper. The functional deficits seen in these patients, however, point out that proximal muscles have more than fixator actions, and that they are capable of fine functional activities. Such a sublimation of the function of these muscles can be seen in the painter's ability to "paint with his shoulder," and in the above-elbow amputee's ability to write on a blackboard.

Delayed return of proximal muscle groups in the leg was evidenced by the persistence, until a late stage of recovery, of a reversed Trendelenburg gait. Careful muscle testing showed that weakness in hip abductors and extensors was responsible for the persistence of this limp, and that later in recovery, paresis of the gluteus medius alone could be incriminated. In testing the function of the gluteus medius, therefore, particular attention had to be paid to the prevention of substitution movements. Hence, it was our custom to observe the rhythm of bilateral abduction of both legs simultaneously (see figure 4). It was observed too that the ability to perform full range of internal rotation at the hip against resistance could be used also as a critical index of the function of the gluteus medius. Hip extension, with the knee extended, was accomplished some two months before the hip could be extended with the knee flexed at a right angle. Likewise, recovery of the functions of adduction and external rotation preceded recovery in their antagonists by a similar interval of time. Imbalances between rotator muscles of the hip were productive of the same dysmetria which we had observed in the arm, and were considered to be in part responsible for much of the difficulty in the performance of the heel-knee test.

Other factors which interfered with complete recovery

Lateral leg weakness.—In 47 patients we observed the occurrence of a phenomenon which we labelled a "lateral leg group weakness," consisting of delay to return of synergic contractions in hip internal rotators, biceps femoris, and foot evertors (figure 5). We found that much of the delay in restitution of dorsiflexion in eversion could be related to this impaired synergy. Recovery was seen as a restitution of the entire synergy rather than as a "piece-meal" recovery in the individual components. However, there was always greater delay in the accomplishment of complete eversion of the foot.

Abdominal weakness.—Unilateral abdominal weakness was observed in 44 of the 70 patients during recovery. These patients were seen to come forward from the lying position in an asymmetrical manner, usually with the less affected hand reaching out towards the more affected foot. Such unilateral weakness was considered to be in part responsible for the truncal ataxia which many patients exhibited early in ambulation. Application of an abdominal belt was of real value in overcoming this "spiralling" during early ambulation.

Sensory deficits.—These were observed in 57 patients in the entire series, and in 20 patients whose brain damage had been caused by vascular insults. Of most frequent occurrence were adiadokokinesia, impaired joint sensibility, cerebellar deficits, and astereognosis.

Adiadokokinesia, or inability to perform rapid alternation in movement, was observed in muscles acting over all the joints of the arm. The ability to alternate rapidly between pronation and supination was one of the last skills to be restored following brain injury.

Impaired joint sensibility was seen in 49 patients, as an inability to distinguish the position of either the great toe or the index finger. We also observed lesser degrees of proprioceptive loss in muscles acting on more proximal joints. In the presence of this sensory deficit, it was

necessary to carry out muscle testing and reeducation procedures only when the patient could clearly see the action of the muscle.

Cerebellar deficits were present in 7 patients, and in 4 patients were the only residual signs of brain injury. In 1 patient, we observed a typical pattern of restitution of motor functions to the highest level without any apparent reduction in the signs of cerebellar disease. We were unsuccessful in the application of any method of retraining directed towards reversal of cerebellar deficits.

Astereognosis, or loss of power to recognize, objects by touch or feel, was demonstrated in 23 patients. Doubtless, this deficit occurred more frequently than this, but in the more severely disabled patients, testing was not performed with ease.

Fatigue.—The complaint of easy fatigability was offered by many of the patients in older age groups. It was manifested as a lack of cooperation with treatment procedures long before there was any sign of decrement in reflex activity.

Ischemic Pain.—Pain, arising from impaired blood supply to the distal parts of both legs and arms was observed to be a factor which caused delay in the rehabilitation of 13 patients. These patients were all in the older age group, and were all included under the heading of cerebral vascular accidents of unknown etiology. From 6 of these patients, we elicited symptoms rather similar to those offered by poliomyelitis patients with the "cold leg syndrome." Peripheral pulses in all of these patients were adequate, but there was apparently inadequate venous return due to diminished muscle power. Ischemic pain in the hand was frequently found to accompany contractures of the finger groups, especially of the finger flexors.

Epileptic seizures were reported in only 3 patients in this series. In 2 of these, there was a typical "jacksonian march" in the nature of the seizure, and in the other patient, there were three episodes representing petit mal. These incidents had been more or less anticipated, and caused no delay in the program of muscle retraining.

Regression to old habit patterns.—We had the opportunity to observe 3 patients who regressed to more primitive patterns of motion after apparently complete recovery. All had the ability, when they concentrated greatly on the effort, to perform normal habits of gait and to use the arm and hand effectively, but when they ceased to concentrate on the performance of these lately learned activities they were seen to regress to older habit patterns. A common finding in these 3 patients was a marked intellectual deficit, as judged by ability to abstract or to compute mathematical tasks rapidly.

Figure 5. Asynergia between hip internal rotation, biceps femoris and dorsiflexion in eversion. (Right leg)

SUMMARY

Levels of spontaneous restitution of motor functions, occurring in a series of 70 brain-injured patients, have been described.

Recovery to the level of gross limb synergies, observed in 29 patients, has been shown to be selective in nature, to occur most commonly in postural muscles. When recovery became arrested at this stage, the clinical findings were those of a stiffly-extended leg and a flexed upper extremity.

Recovery in 10 other patients became arrested when they could perform volitional movements at the elbow and knee joints.

Another plateau in muscle recovery was seen in 20 patients who could perform dexterous hand functions in addition to the above earlier acquired abilities. Return of motor skills in these patients had occurred to a greater extent in distal muscles than in the proximal "fixator" muscles.

We observed complete restitution of all motor functions in but 11 patients.

Sensory deficits which interfered with motor return were seen in 57 of the patients in this series.

Selective Reeducation and the Use of Assistive Devices

Walter J. Treanor, Capt., MC, Olena M. Cole, Major, WMSC, and Rosie Dabato, 1st Lt., WMSC

Based on our observation of patterns of motor recovery in 70 brain-injured patients, a program of selective muscle reeducation of paretic muscles has been developed. While in no sense original, this program differs from every preceding one in two main features. First, we utilized the reinforcement technics introduced by Phelps and separately by Kabat, as the means of activating certain muscle groups exclusively. For example, we emphasized, throughout most of the recovery cycle, selective reeducation of the extensors of the arm and of the flexors of the leg. Second, we made every effort to curtail afferent stimuli which could "facilitate" recovery in the opposing postural muscle groups, and therefore curtailed ambulation until late in recovery. An attempt has been made to point out the need for careful "timing" in any program of retraining of muscle functions following brain injury. Finally, we have made a critical study of some of the more commonly used braces and splints.

I. To the Level of Limb Synergies

A. *Positioning in bed.*—Proper positioning of the paretic limbs was instituted early in the phase of generalized hypotonia. Particular attention was paid to the position of the shoulder, to rotation of the femur on the pelvis, and to support of the ankle joint. The ward nurse or the patient's relatives were instructed early in passive exercises and correct placement of the arm, particularly in methods for maintaining full abduction and external rotation of the shoulder. If the position of full abduction became too painful, the arm was then kept abducted to about 90 degrees and was still retained in full external rotation. We stressed the necessity for persistence in these attitudes throughout the entire day, and the physical therapist devoted most of the early sessions to the indoctrination of ward personnel or of relatives in these technics of positioning. Sand bags were used on the outer side of the thigh to prevent femoral rotation. External rotation of the tibia on the femur was prevented by the use of a simple posterior canvas splint, fitted with an antirotator bar on its outer side (see figure 1). This not only preserved a correct alignment at the ankle and tarsus, but in addition provided a contactual stimulus to the plantar surface of the foot. Some patients were nursed for a period of time in the side-lying position with the more involved extremities lowermost. This was found of use in reducing reflex hyperactivity in the flexor muscles of the arms.

B. *Muscle retraining.*—Within the first 4 to 10 days the physical therapist attempted to assess, by means of reflex and nociceptive stimulation, the amplitude of latent contractions in paretic muscles. Thus, tendon stimulation of the quadriceps often gave an early indication of the amount of "dormant" activity in this muscle. Likewise, it was customary to test the reflex response of the flexor muscles of the leg by the application of painful stimuli, such as "pinching" of the sole of the foot or of the achilles tendon, and acute plantar flexion or adduction of the great toe. Stretch stimuli, applied to the biceps and triceps brachii, and contactual stimulation of the palm of the hand had similar usefulness as aids in prognosis.

Emphasis on selective muscle retraining followed closely upon these simple diagnostic measures. Proprioceptive stimulation of the quadriceps muscle was continued, by use of tendon tapping and by encouraging the patient to "hold" an isometric contraction of this muscle. During this, the physical therapist maintained contact against the plantar surface of the foot as another method of reinforcing quadriceps activity. Facilitation of quadriceps function was also seen to result from active spine extension. Manual resistance was offered to the quadriceps muscle throughout its range of optimal reflex or volitional contraction. Since standing in itself was

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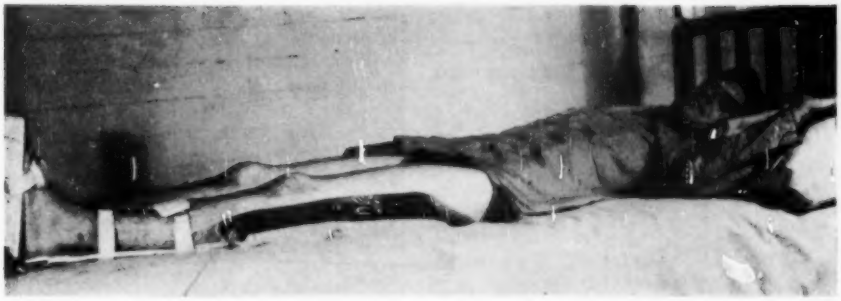

Figure 1. Alignment in bed.

found to be an effective method of promoting return in quadriceps function, the patient was prepared at this stage for early standing. As aids in the accomplishment of this, the physical therapist had first to secure a pair of laced oxford shoes, a posterior aluminum (gutter) splint, and to instruct the patient in truncal balance (figure 2). For the latter purpose, training in truncal balance, the patient early in his convalescence, was slowly raised to a sitting position in bed, and was instructed in mild to progressive exercises for strengthening of weakened abdominal muscles. At times it was found that an abdominal belt also was necessary before satisfactory standing could be accomplished. It was practically axiomatic that sitting balance would have to be mastered first before the patient could make any worthwhile attempt at standing. The physical therapist usually found it preferable to carry out further treatment measures in the physical therapy clinic.

Figure 2. Aids in early standing
a. Abdominal belt with posterior straps
b. Aluminum "gutter splint"
c. Oxford shoes with leather straps

During all this preliminary treatment, the physical therapist kept a careful check on the patient's pulse and respiratory response to the exercise program. She was thoroughly objective in her assessment of the patient's gains or losses in muscle power, and was especially diligent in reporting any deterioration in muscle strength to the attending physician. The detection of minimal, progressive weakness in 2 patients in this series was the earliest indication that the cause of spastic paresis was a hidden brain tumor rather than a cerebral vascular thrombosis. The physical therapist also was careful to watch for signs of deficient oxygenation, particularly for evidence of any cranial nerve involvement.

If, after transfer to the clinic, extensor hypotonia still persisted, the standing table was used as another means of stimulating knee extension. With increasing reflex activation of this movement, patients were advanced to standing between parallel bars, at first with, and finally without external support. When patients were able to stand without any external support for either leg the emphasis was changed to selective retraining of the opposing flexor muscles of the leg. Furthermore, it was our practice at this time temporarily to "ground" all patients. Our rea-

sons for this rather radical departure from presently accepted methods were threefold.

1. Excessive activity in postural muscle groups was the most consistent finding in the 70 patients whom we observed. In all but 10 of these patients there was a much more rapid return, both of reflex and volitional nature, in the extensor muscles of the leg than in their antagonistic flexor muscles. Further accentuation of this distribution of hypertonus always accompanied attempts by the patients to stand or to ambulate.
2. Early in this study patients were encouraged to stand and walk as soon as the quadriceps power was adequate for support. In every instance, this policy resulted in further impairment of the fixator muscles of the hip, and in further aggravation of the compensated Trendelenburg limp.
3. Persistent attempts at ambulation were seen to cause accentuation of the existing imbalances between strong flexors and weak extensors in the arm, and were found in all patients to favor earlier volitional return in the flexor muscles of the arm.

II. To the Level of Restored Phasic Activity at the Second Joints

Muscle retraining in this stage of recovery was directed exclusively toward restoration of the flexor groups in the leg and of the extensor groups in the arm. In the arm, all stimuli which were found to excite increased activity in the flexor muscles therefore were rigidly excluded. For this reason occupational therapy procedures were not employed at this stage in recovery. When flexor hypertonus was showing signs of an excessively rapid rate of return, static and functional aluminum splints were used to protect the extensor muscles from overstretching. The most commonly employed ones were a rigid supinator splint and a simple pancake hand splint to retain the fingers in extension at all joints. At this time, we also devoted attention to maintenance of the thumb web, and to the resting position of the first digit at the metacarpophalangeal joint. A modified Warm Springs wrist dorsiflexor splint with "outriggers" was used to retain correct alignment of the thumb and of the index finger.

For retraining of triceps activity, the patient lay supine with the arm placed in 90 to 110 degrees of forward flexion at the shoulder joint. The triceps was then stimulated reflexly by tendon tapping, or by means of a tetanizing faradic current, and resistance was applied manually throughout that range in which the muscle was contracting most strongly. Commonly, the greatest amplitude of elbow extension was observed with the forearm held in incomplete pronation, but no attempt was made at this stage to correct this pattern of movement. Augmentation of triceps activity by use of tonic neck reflexes, and of righting reflexes, also was found useful in a few patients. Gradually patients were "weaned" from their dependence on these aids to contraction, and finally resistance was applied only during volitional contraction. For reeducation of intrinsic shoulder abduction we had to depart from the practice of using the antigravity position. This was made necessary by the lack of scapular stability resulting from gross weakness in scapular fixator muscles; hence, reeducation exercises for shoulder abduction were always performed with the patient lying supine. For similar reasons, the supine position was adopted for reeducation of the combined movement of shoulder external rotation and forearm supination. We found that the amplitude of wrist dorsiflexion could be substantially increased by "overflow" activation during resisted elbow extension. The extensor carpi ulnaris could be reinforced more easily than the radial extensors when this technic was employed. No attempt in this stage of recovery was made to reinforce wrist dorsiflexion by "overflow" innervation from resisted elbow flexion because of the real danger of further augmenting flexor hypertonus by use of this maneuver.

Reeducation of the movement of knee flexion was best performed in an antigravity position. Following prior stabilization of the pelvis to prevent hip flexion and to minimize the effect of rotator imbalances, the patient attempted to flex the knee through the widest arc of motion possible. His volitional efforts were augmented by simultaneous nociceptive stimulation of the foot, or by strong pinching of the tendo achillis. Steadily increasing manual resistance was then applied to hamstring activity, particularly to the biceps femoris. A few patients were found to activate the hamstrings more strongly if their feet were held in sharp dorsiflexion, either manually or by means of simple splints or braces. When sufficient volitional control of knee flexion had returned, weight resistance exercises were added. Finally, patients were examined carefully for their ability to perform knee flexion when they assumed the standing position. Walking was not recommended until the patient could, while standing, freely flex the knee joint to 90

degrees without any associated flexion at the hip joint. When patients had acquired this degree of volitional control of knee flexion, we were no longer unduly concerned about the likelihood of their developing an extensor hypertonus on attempted ambulation. Ambulation, however, was still deliberately curtailed because of the persistent weakness in the fixator muscles of the hip.

Throughout this phase of recovery it was also our practice to continue to work on the strengthening of hip flexion and of dorsiflexion of the foot by a similar progression from assistive to resistive exercises. The patient was instructed to perform hip flexion with the anterior surface of the femur in a position neutral between internal and external rotation. With the hip held in flexion, manual resistance was applied by pressure on the thigh in a downward and inward direction. Resistance in this plane was emphasized because of the consistency with which patients would try to return to an earlier pattern of hip flexion in external rotation. Prior positioning of the hip in flexion and internal rotation was also used as a means of early reeducation of the movement of dorsiflexion and eversion of the foot. It was about this time, also, that we made our first attempts to reeducate and strengthen the movement of primary hip abduction. For obvious reasons, no attempt at reinforcement of hip extension by resisted spine extension was permitted at this level of recovery.

III. To the Level of Recovery in Distal Muscle Groups

Leg.—Emphasis in retraining was shifted, at this point, to the distal muscle groups, with the same insistence on exclusive reeducation of the flexor muscles in the leg and of the extensor muscles in the arm. In the leg, the objectives were the restoration of isolated dorsiflexion and the correction of imbalances between the invertors and evertors of the tarsus. Increasing manual resistance was applied to the tibialis anterior during mass flexion of the leg. As this muscle became strong enough to contract against increasing resistance, the amount of concomitant knee and hip flexion was gradually reduced. The tibialis anterior was given a "normal" rating only when it was sufficiently strong to dorsiflex the foot fully while the patient attempted to walk on his heels. Correction of persistent weakness in the evertor muscles was found to be one of the most challenging features in the entire program of reeducation. After trying, and having to abandon, many technics of reinforcement, we found that the movement of dorsiflexion in eversion was most easily elicited following prior placement of the leg in a position of internal rotation at the hip joint. Painful stimulation, applied to the dorsum of the foot, also augmented the range and strength of this movement. Early in recovery, when eversion could not be "driven" by either of these maneuvers, or by resisted sideward bending of the spine, it was necessary to resort to reeducation with the aid of a faradic current.

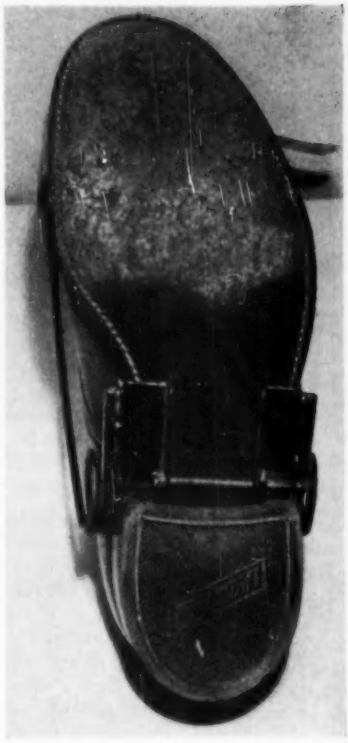

Figure 3. "Screw on" foot-plate for short leg brace.

Bracing.—Since limited ambulation was allowed at this level of recovery, it became necessary to decide the type of brace needed for the correction of existing imbalances in the foot. Choice of the brace for an individual patient was influenced by two major considerations. First, the brace had to be sufficiently strong to provide the stability of a plantigrade foot. Second, it had to be sufficiently light to offer little

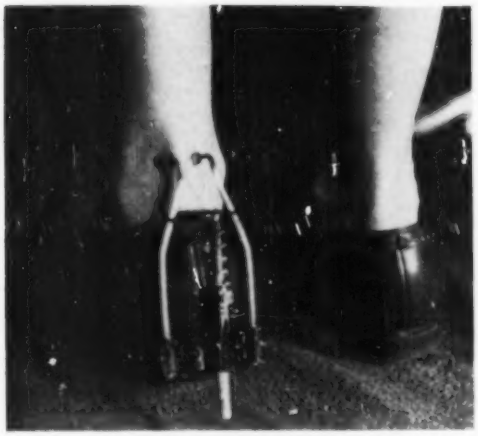

Figure 4. Intermittent pressure clamp to aid flexion.

impediment to the movement of knee flexion. We were guided also, by the principle that bracing should be considered as only a temporary expedient; for this reason, we were reluctant to fit any permanent type of brace until the ultimate in recovery had been reached. Where possible, interchangeable orthopedic shoes and adjustable short leg braces were used during these early attempts at ambulation. For patients with only moderate equinovarus, we used a light adjustable "piano wire" brace, which could be fitted on any leather soled shoe, by means of a screw-on foot-plate (see figure 3). For patients with more marked equinovarus, we preferred the stability offered by a double iron brace fitted with a Perlstein ratchet attachment. This attachment allowed for changes in the angle of correction in individual patients. We also used a third type of appliance, an intermittent pressure clamp, as an aid in determining the potential reversibility of an established extensor pattern, and also as a means of reeducating flexor muscles during ambulation. By means of this simple device, it was possible to apply a painful pressure stimulus to the tendo achillis throughout the swing phase of gait. From the response of the flexor synergy to this method of stimulation, we could then estimate the likelihood of retraining the flexor muscles by any of the usual methods of reinforcement (figure 4).

Several patients with spastic hemiparesis were referred to us from other installations after they had been fitted with either long leg braces or heavy spring tension ankle braces. In every instance, we removed these appliances because it was apparent that they were aggravating the existing hypertonicity in the extensor muscles of the knee and ankle. Likewise, it was our practice to discard any previously fitted valgus T straps. In their place, we substituted a leather strap, placed well forward of the midtarsal joint. The line of pull of this strap was approximately that of the peroneus tertius. Three patients had been fitted elsewhere with shoe "lifts" on the less involved foot. All had become adept at shuffling the paretic leg forward by the aid of this device. Furthermore, they had become so accustomed to this pattern of ambulation that retraining of knee flexion was not possible in 2 of the patients, and required an unusually long time in the third. Since the emphasis throughout this program was on retraining of active knee flexion, it was our consistent policy to avoid the use of any devices, such as long leg braces or shoe "lifts," which could in any way be implicated in the production, or aggravation, of a "hemiplegic gait."

In the presence of incomplete recovery in the function of the vastus medialis, we used a "knee cage" to prevent persistent locking in hyperextension. This device, plus a careful program of reeducation of the movement of terminal extension, resulted in a marked improvement of the gait in 2 patients. Spontaneous recovery of the function of terminal extension occurred so late that definitive reeducation for this function was not attempted until knee flexion could be accomplished with great ease.

Hand.—The program we adopted for reeducation of hand movements was the natural consequence of our observations on the sequence of spontaneous recovery. Patients were seen to develop flexion activities before extension, spontaneously, and they showed more rapid restitution of "extrinsic" finger extension than of extension performed by the lumbricales and interossei. The emphasis was therefore on retraining of extensor hand muscles and on isolated functioning of the short intrinsic muscles. Faradic stimulation (60-150 cycles per sec.) of the extensor muscles, supplemented by manual resistance during contraction, was of use in reeducation. A bipolar technic of stimulation was used, the antigravity position for the muscle was more commonly chosen, and manual resistance was applied during the electrically induced contraction. Occasionally, we found that prior placement of the wrist in extreme palmar flexion could be used as another means of facilitating weakened finger extensors. Splinting of the metacarpophalangeal joints in partial flexion by means of an Oppen-

heimer "knuckle-bender" was one method of overcoming overactivity of extrinsic extension, and was an aid in the reeducation and strengthening of extension at the interphalangeal joints.

In the thumb, similar patterns of substitution by extrinsic muscles also had to be guarded against. We paid particular attention to the retraining of the movements produced by the abductor pollicis brevis and the extensor pollicis brevis. Restoration of active movement in these muscles appeared to be the only certain method of preventing either thumb web contractures or dorsal subluxation at the metacarpophalangeal joint. Retraining of these muscles, and also of the opponens pollicis, was essential for the restoration of an ability to perform even a crude pinching movement.

Finally, patients had to be trained to perform extension and abduction movements of individual digits. When they had mastered this ability, many still had difficulty in using the hand for skilled activities because of an inability to perform rapid alternations in movement, or because of persistent impairment of joint sensibility. We found that occupational therapy had most to offer as a means of overcoming these deficits. Because of the delayed return in supinator function and also in the fixator muscles of the proximal extremity, the occupational therapist was always particular about prior fixation of the arm at the shoulder and elbow. Hence, no activity was recommended which demanded the use of the arm in an unsupported position. The occupational therapist was also careful to exclude hand activities, such as squeezing rubber balls and handling doorknobs, which further accentuated earlier return in finger flexors. Patients were instructed in methods of using the less involved hand for strengthening of finger and thumb extension on the more involved side.

IV. To the Level of Recovery in Proximal Groups

As noted earlier, we observed a delayed return in the fixator muscles of the hip and shoulder joints in 31 out of the total of 70 patients. We were particularly impressed with the persistence of this proximal group weakness despite the employment of many methods of facilitation. Indeed, in the entire series, there were only 11 patients whose final manual muscle test revealed no signs of weakness in these muscles. No method of reeducation and strengthening could be described as wholly satisfactory. Reeducation of shoulder elevation was accomplished by the application of manual resistance initially to side bending of the neck and later to bilateral shoulder "shrugging." Retraining of the functions of the serratus anterior and of the inferior fibers of the trapezius was found to be an even more difficult undertaking. None of the usual methods of reinforcement was found easily applicable to these groups. In no instance did we attempt either electrical stimulation of the nerves to these muscles, or the protection of serratus anterior weakness by bracing.

Retraining of paretic hip muscles was undertaken in a specific order. First, we concentrated on attempting to restore active hip abduction and internal rotation. Patients contracted the gluteus medius on both sides simultaneously in the performance of these movements, as a means of overcoming "pelvic tilting" by the lateral abdominal muscles. For reinforcement of the movement of hip abduction, patients were placed in the prone position, and attempted to abduct both hips simultaneously through a limited range. Total spine extension was used occasionally as an additional means of reinforcing this movement. When contraction was felt in the gluteus medius, progressively increasing manual resistance was offered, augmented by simultaneous traction on the feet. Strengthening of the gluteus medius was not attempted in the antigravity position until patients were able to abduct through a complete arc against strong manual resistance. Finally, we undertook retraining of the movement of hip extension. While the patient was lying prone, he was asked to extend his hip as a part of the combined pattern of total spine extension. Gradually, reinforcement by spine extension was eliminated, and finally hip extension was attempted with the knee previously placed in flexion.

Recovery in these fixator muscles of the hip was considered to be complete only when the patient had satisfied the following criteria:

1. A complete reversal of the Trendelenburg limp.
2. No complaints of weakness or tiredness after a normal day's activities.
3. A completely restored "lateral leg synergy."
4. No signs of regression to old habit patterns during ambulation.

These criteria of normalcy were adopted because of the finding that manual muscle tests were insufficient in the grading of function return in these strong fixator muscles. Gravimetric testing of the strength of these muscles was found of real value in a few patients, and we

have observed differences as great as 10 to 15 pounds between muscles which had been given equal ratings on manual muscle testing. The only real test of recovery in these muscles is an ability to walk moderate distances without symptoms of pain or tiredness.

PATIENTS WITH PARADOXICAL ATTITUDES

All patients with knee and hip flexion deformities and concomitant plantar flexion of the foot were routinely fitted with bilateral long leg braces. This was done because our primary concern was for the early correction of the pull of hyperactive knee and hip flexor muscles. It was our experience that the equinus of the foot could be corrected at a later date by use of the usual reinforcement technics. Facilitation of knee and hip extension was noted when patients attempted spine extension, and when they attempted to walk on their hands with the legs held out straight ("wheel-barrow position"). Manual resistance was offered to the contractions so produced. The same pattern of reinforcement of primary hip abduction was carried out as has been outlined in an earlier part of this report. In gait training, great emphasis was placed upon broadening of the base of support, and on external rotation of the feet. For these purposes the braces were fixed in 10 to 15 degrees abduction and in slight external rotation to correct the pull of hyperactive adductors and internal rotators. The brace was also employed as a night splint when suitably wrapped with woolen covering. We also advised the children to stand throughout as long a period of the day as they could tolerate. When they became able to extend the knee actively through a range of 50 to 60 degrees, resistance was applied to the contraction in the antigravity position. Only when the patient could extend the knee about 160 degrees in this position was the emphasis in retraining changed to the correction of foot equinus and varus. The methods for the accomplishment of this have already been outlined.

EXTENSOR LEG WITH VALGUS OF THE FEET

We have had a limited experience in the correction of this deforming attitude and a wholly inadequate follow-up of the cases we have treated. Again the method of selective reeducation of the more paretic muscle function was adopted, and for this reason we concentrated on reinforcement of isolated tibialis anterior function. The foot was held in an overcorrected position of varus by means of an inner wedge on the shoe of 1/8 to 3/16 of an inch in width. A split-tongue attachment was also placed along the inner sole of the shoe to promote further varus of the forefoot. Prolonged gait-training was needed to "wean" the patients from their habit of walking with the feet rotated outwards.

DISCUSSION

This outline of a treatment program for the residual paresis following brain injury is in essence an attempt to establish a "middle ground" between the standard methods of reeducation, such as are employed in the after care of poliomyelitis, and the newer methods of proprioceptive facilitation. We have therefore freely borrowed from systems devised by others, and have merely attempted to systematize diverse technics into a purposeful program of treatment. We have made extensive use of Kabat's methods of reinforcement, and have found them uniformly of benefit in the activation of "dormant" anterior horn cells. However, we have consistently avoided employment of his technics where they ran counter to our own methods of selective reeducation. Thus, reversal of antagonists was never used in retraining of arm extensor activities, because we found that it contributed little to the correction of the flexor imbalance in the arm. Moreover, we were particularly insistent on the restoration of isolated function in muscles, and were never content to settle for mass movement patterns of activity as an ultimate in recovery. It was for this reason, also, that we rigorously avoided the employment of activities of daily living during the early phases of recovery. It was our practice to withhold all such activities until it was clinically apparent that the final level of functional recovery had been reached. We insisted on the easy performance of less refined functions before patients were advanced to activities which demanded greater dexterity.

Since many of the patients in this series were suffering from degenerative vascular diseases, it was not surprising that the widespread employment of resistance exercises was attended with some danger. Resistance exercises very probably were incriminated in the production of a coronary infarction in 2 patients and of a pulmonary thrombosis in another. Among the other treatment hazards which we encountered were fracturing of the great toe during the application of a noxious stimulus, and the production of a causalgia (painful osteoporosis of the os calcis) in 2 patients, because of precipitate attempts at

standing. Three patients with partially resolved hemiparesis were admitted to this service with hip fractures. In all instances, an incompletely corrected equinovarus position of the foot together with marked hypotonia of the fixator muscles of the hip were important factors in the causation of the fractures (figure 5). No skin burns were observed in any of the patients, despite the presence of sensory deficits in a high proportion of the total. The existence of hypalgesia, however, did add to the difficulties of fitting foot braces in two patients.

Any system of retraining motor skills following brain injury has to be judged for its usefulness in speeding the rate of spontaneous recovery. It has appeared to us that many workers have underestimated the extent of such recovery, and have made rather specious claims for the especial advantages of their own systems of reeducation. We have hesitated therefore to add yet another empirical system of treatment to this plethora of existing methods. Moreover, the finding of complete motor recovery in only 11 patients (15 percent of the total) offered little justification for any strong advocacy, on our part, of the type of program we employed. The only claim we have advanced for its efficacy was that this type of program appeared to influence favorably the rate, as opposed to the extent, of the patient's progression through the various levels of motor recovery.

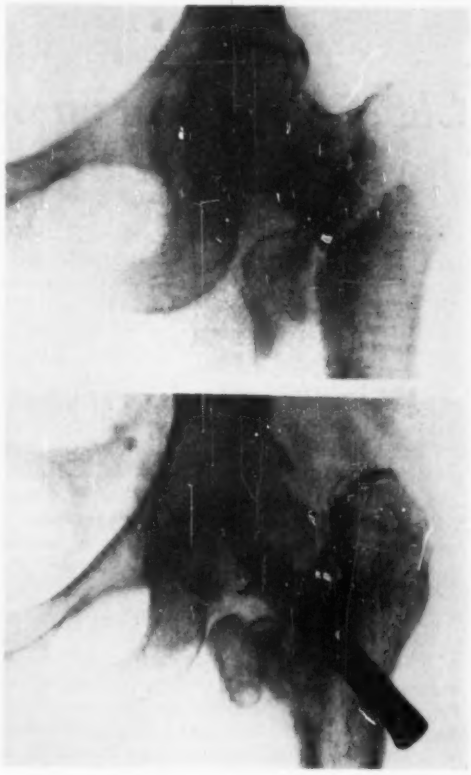

Figure 5. Hip fractures secondary to hemiparesis in one patient.
Above: After initial fall (1953)
Below: After second fall (1954)

SUMMARY

1. A program of selective reeducation of arm extensor and leg flexor muscles has been outlined.

2. Because ambulation was seen to result in an increase in postural hypertonus, we have advocated the curtailment of standing or of ambulation during most of the recovery cycle.

3. Measures for the protection and retraining of the muscles of the hand and the foot have been presented.

4. The delayed return of proximal fixator muscles has been emphasized, and measures for the protection and retraining of these muscles have been discussed.

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New Publication by Association — Non-professional Personnel

The American Physical Therapy Association announces the publication of an illustrated pamphlet to assist the physical therapist determine the need for non-professional personnel and to give guidance on inservice training and utilization.

Clinical Application of the Paraffin Cast

Morris Vogel B.S and Lawrence Weinstein, B.S.

The use of paraffin as a therapeutic agent dates back to the nineteenth century. Originally used for the treatment of burns, its clinical value for the relief of rheumatism, gout, sciatica and other diseases was expressed by Barthe De Sandfort in 1829. While it is generally agreed that no unusual value may be attributed to paraffin except its heating properties, it is a fact that temperatures of 130° F. to 136° F. are readily tolerated by the skin, although a water bath of this temperature would burn the skin. This tolerance may be explained by two possibilities: Lampert believes that through the high temperature, a heat insulating layer of water vapor is formed between the skin and the paraffin, thereby preventing the high temperature compound from coming into direct contact with the skin; we are of the opinion that paraffin, having a higher specific heat retention capacity than water, gives off its heat more slowly per unit of time. This allows the available capacity of the circulation to carry excessive heat away from the part, thus the heat is more readily tolerable at higher temperatures over a given area, and, in addition, permits its effect to last over a longer period of time.

As far as the authors can ascertain from the literature, the method of using paraffin as a therapeutic modality has been more or less restricted to the conventional paraffin pack technic. Satisfactory results by means of this therapeutic technic have been widely reported in cases of osteoarthritis, traumatic and rheumatoid arthritis as well as in residuals of various orthopedic disabilities. It is likely that many of the benefits accruing from these treatments lie in the fact that skin temperature increases from 20° F. to 25° F. are attained immediately after the extremity is removed from the bath, and after this temperature is reached, the heat loss is comparatively slow until 30 minutes after removal when skin temperatures approach original readings.

While this technic is certainly adequate as symptomatic therapy for the relief of pain or as a preliminary measure to massage and therapeutic exercise, there are many indications for prolonged heat and immobilization for periods in excess of the usual 30 minute treatment. It is in such cases as painful traumatic conditions, tenosynovitis, chronic rheumatoid arthritis and similar disorders that a paraffin cast has been effectively employed.

The conventional application of the paraffin pack or bath follows a general pattern. After a thorough cleansing and drying to rid the part of dirt and oil, the member to be treated is dipped in and out of the paraffin so that a thin coating adheres to and congeals on the skin. This procedure is repeated 4 to 5 times. The extremity is then kept submerged in the paraffin bath for 20 to 30 minutes. As an alternate procedure, a "glove" may be allowed to form after repeated immersions in the molten paraffin. Following this, the extremity is removed from the paraffin bath and is wrapped in turkish towels or oil silk for approximately 30 minutes.

The paraffin cast, a relatively new and infrequently used innovation is a convenient, easily fabricated and highly satisfactory method of combining the therapeutic heating effects of paraffin with the immobilization properties of an orthopedic type cast for periods as long as 24 hours. It has been used successfully by the authors, under medical direction and supervision, for tenosynovitis, uncomplicated sprains and strains of the wrist and ankles, and for subacute rheumatoid arthritic joints.

The technic of application used in the Physical Therapy Section of the Veterans Administration Hospital, Bronx, New York, is as follows:

The part being treated is first thoroughly cleansed and dried. Ordinary unsterilized 2″ roller gauze is then applied in a routine manner to the extremity starting, in the case of a wrist pathology, at the metacarpophalangeal joint and extending proximally to about 3 inches above the wrist joint, excluding the fingers, (figure 1). Two thicknesses applied loosely are usually sufficient to anchor the gauze adequately to the involved part. Following this, the entire hand to 3 inches above the

Morris Vogel, Chief, Physical Therapy, Bronx Veterans Administration Hospital; Lawrence Weinstein, Assistant Chief Physical Therapy, Bronx Veterans Administration Hospital, New York, N. Y.

Figure 1.

Figure 2.

wrist is submerged in the paraffin bath of 127° F. (figure 2). As an alternate method the paraffin may be applied to the hand carefully with a small brush. The hand is then removed and the cast is carefully molded, and allowed to dry. A second application of roller gauze is applied in a manner similar to the one described above, and the hand is dipped again into the bath, or paraffin is applied to the part with a brush and the initial procedure is repeated. Approximately four to five repetitions are required for the formation of a simulated orthopedic cast. When a satisfactory paraffin cast is fabricated, the excess paraffin, which has accumulated on the fingers is removed and the cast is smoothed manually by the physical therapist, especially at its distal and proximal ends to prevent loss of heat from occurring at these areas (figure 3). When the cast is sufficiently dry and securely in contact with the wrist, a 3-inch Ace bandage is applied over the entire cast to prevent excessive dissipation of heat (figure 4). The application is allowed to remain for approximately 24 hours, after which it is cut off and reapplied, if necessary. Ordinarily five applications are sufficient to

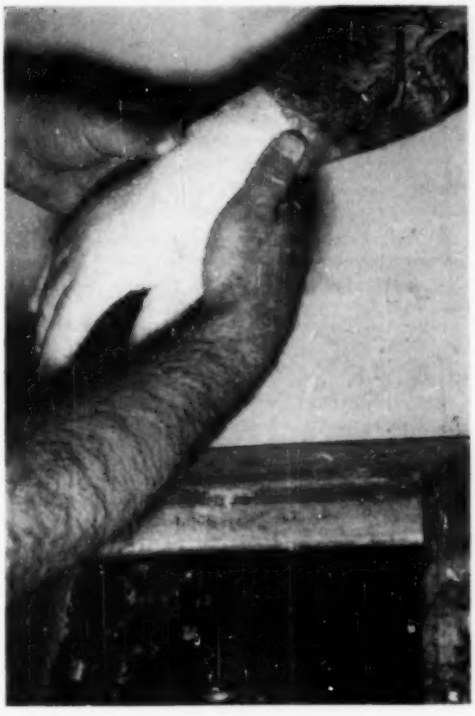

Figure 3.

Figure 4.

produce a satisfactory result in ordinary uncomplicated cases of tenosynovitis and sprains. By recording skin temperatures with an electronic multichannel recording thermocouple apparatus (Speedomax), it was found that an average temperature rise of approximately 10° F. was maintained over a 12-hour period. This factor, together with the partial immobilization of the extremity, undoubtedly accounts for the uniformly good results observed from this therapeutic measure.

The ease of application, its low cost and the consistently good results accruing from this treatment makes it an excellent one in the management of uncomplicated traumatic injuries.

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Statement Required by the Act of August 24, 1912, as Amended by the Acts of March 3, 1933, and July 2, 1946 (Title 39, United States Code, Section 233) Showing the Ownership, Management, and Circulation of

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Editor: E. Jane Carlin, 1790 Broadway, Room 310, New York 19, N. Y.

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Vice-President, Lucille Daniels, Division of Physical Therapy, Stanford University, Box 101 Stanford Village, Stanford, California.

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5. The average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during 12 months preceding the date shown above was: (This information is required from daily, weekly, semiweekly, and triweekly newspapers only.)

Carol Vance, MANAGING EDITOR

Sworn to and subscribed before me this 22nd day of September, 1954.

Helen Lipshie

[Seal] NOTARY PUBLIC, State of New York
My commission expires March 30, 1956

Mit Den Besten
Wünschen Zum
Weihnachts-und
Neujahrsfest

Meilleurs Voeux et
Souhaits Sincères

Glaedelig Jul og
Gott Nytaar

Merrie
Christmas

Hyvää Joulua
ja Onnellista
Uutta Vuotta

Buon Natale
e buon
Capo d'anno

Vrolijk
Kerstfeest

En glad jul
og et
Godt nytt år

God Jul och
Gott Nytt År

Augura felicidad
para el año
neuvo

Not just the holly
Not just the pine
Nor flaming of candles
Makes Christmas so fine –
But the spirit of Friendship
That reaches afar –
To wish Merry Christmas
Wherever you are."

May your Christmas be merry
and also be blessed,
And God grant you a New Year
filled with the best."

Editorials

THE following remarks are addressed to those of you who form the group known as the "older" physical therapists, who supervise or work directly with older staff members or who can fairly objectively visualize yourselves at a period fifteen years hence.

If you are an older physical therapist, you may be an administrator, a supervisor, research worker, teacher or staff member. Our civilization seems to make it imperative that we constantly strive onward and upward. Studies have conclusively proved that all normal persons at any age can and do learn and education is based on the accepted principle that human nature does change. So, at age 55 as at age 35, one is preparing himself for the job ahead by observation, study, and active experiencing. It is probable that the older person will make up in wealth of experience for any lack in speed of learning. Must all older workers follow the same pattern of progression? You may have a graduate degree. Should it be considered as a waste of talent if you are not in a teaching position? Your main interest may be in treating patients. Because of your seniority, should you be expected to be an administrator or a supervisor instead of a staff member? You may think you have found your niche, one where your patient treatments are on the highest order and you feel the utmost satisfaction and pride in accomplishment. Should you make yourself and others miserable because you appear to have reached a plateau? The old tendency to lay off the worker who can not progress is being replaced in some forward looking industrial concerns by a recognition of both the temporary and permanent plateaus which are normal for many fine workers and by an appreciation of the need for "privates," regardless of their age, in almost every enterprise. It would seem that the wisest course for the older worker is to contribute to the maximum of his potentialities within his chosen sphere of interest and within a reasonable framework of happiness. This statement is not to be interpreted as a crutch for the lazy worker or an excuse for inefficiency. Rather, it is intended to give comfort and assurance to those who maintain a consistently high level of productivity on what appears to be a plateau.

It is likely that you as the physical therapist in charge have contemporary or older staff members under your supervision. Do not be afraid that these persons will surpass you and do not think of them as threats to your status. It will be found that the majority of these workers are doing the special work in which they are interested or for which they are trained. Recognizing and utilizing effectively the work of each staff member is the function of the supervisor. He must not allow older workers to lose their place of leadership in the group and he must constantly provide opportunities for them to share their particular knowledge and skills. When their experiences receive respect from the physical therapist in charge, the group will follow his example and the result will be that the older staff member does not feel the need to establish his prestige by constantly recounting what he has done previously. Questions may be asked in such a way that it is evident that the group is seeking advice rather than a final solution, thus no one's suggestion seems to be discounted. A return of initiative and a desire to improve are promoted by providing an opportunity to contribute ideas. Most older workers find it stimulating to be asked by younger personnel to share ways in doing difficult tasks connected with learning situations. Usually the older staff member, in return, will inquire how the younger one is working out similar problems and

the exchange of ideas will bring mutual respect. At all times the supervisor must stress the value of the contributions of all staff members and what they can learn from one another. Growth is stimulated when attention is focused on steps which are being taken for improvement in work and in asking the assistance of everyone in bringing about the necessary improvements. Progress usually is speeded by actually trying out new procedures followed by a comparison with the results obtained the old way. As the judgment and help of each worker are sought, self respect which is the basis for continued growth is established. Ideas must never be discredited on the basis of their time of origin but their value should be judged on how well they meet the needs of the situation. As a supervisor, remember that the majority of older workers look to you for the same leadership, assistance, personal interest, encouragement and build-up as do younger workers. It is your responsibility and your privilege to attempt to satisfy these needs.

Since it is impossible to determine accurately one's potentiality until he actually meets a challenge, it is difficult to see yourself 15 years hence. Will you be a supervisor or perhaps a research worker? It is none too early to prepare yourself by constantly testing out your interests and aptitudes, evaluating your objectives, and devoting study and effort in professional activities which will serve as an investment for your future. You must recognize that all are not suited for or desirous of being administrators or teachers and that it is no disgrace to focus your efforts on patient treatments if that is the area in which your interests and abilities lie. You will see the wisdom in planning ahead for your financial security and in developing hobbies which will give you satisfaction in the years ahead. Daily experiences and associations are constantly combining to make you the person your associates will come to know and respect. The fact must be faced squarely that characteristics, good and not so good, which are possessed today probably will be greatly accentuated with the passage of another 15 years. It is correct to state that your eventual success is most certain to depend to a large degree on two very important factors:

1. Your willingness and capacity for taking infinite pains with and devoting hard work to the job at hand.
2. Your ability to get along with other people.

Whether you are an older physical therapist, supervise an older worker, or expect some day to be classed in this category, it matters little since each age has its share of challenges, satisfactions, and contributions. The road will be easier as each understands more fully his own role and that of his older or younger co-worker.

Marriages

Suzanne Appleton of Canton, Mass., to Howard E. Munro, Moorestown, N. J.

Eleanor Beck of Arlington, Mass., to Hadley R. Rood, East Greenwich, R. I.

Lucille Grafton of Albany, N. Y., now Mrs. Lucille G. Corville, Seattle, Wash.

Barbara Jackson of New Castle, Pa., to Norman Flournoy, Richmond, Va.

Margaret Jervis of Pittsburgh, Pa., now Mrs. Margaret J. Shumaker, Pittsburgh.

Joyce Kadis of Brookline, Mass., now Mrs. Joyce K. Picard, Boston.

Suzanne Kelley of Sault Ste. Marie, Mich., to Paul de Souza, Ontario, Canada.

Nancy Ellen Leue of Mt. Prospect, Ill., to C. D. Danner, Houston, Texas.

Betty J. Lewis of Kansas City, Mo., to Kenneth Miller, Kansas City.

Rita O'Brien of Knoxville, Tenn., now Mrs. Rita O. Stiegel, Los Angeles, Calif.

Angela Paglianete of Forty Fort, Pa., now Mrs. Angela P. Mazzarella, Wyoming, Pa.

Ann C. Ritsher of Dallas, Texas, now Mrs. Ann R. Carter, Chapel Hill, N. C.

Barbara I. Russell of Niagara Falls, N. Y., to Louis C. Washburn, Cambridge, Mass.

Bette J. Spaeth of Aitkin, Minn., now Mrs. Bette S. Kotula, Aitkin.

Barbara L. Wolsey of Winchester, Mass., now Mrs. Barbara W. Thompson, Winchester.

COL. HARRIET S. LEE

LT. COL. AGNES SNYDER

Officers Promoted in Women's Medical Specialist Corps

Two officers of the Women's Medical Specialist Corps were sworn in on November 2, 1954 as Chief and Assistant Chief of the Corps in the Office of The Surgeon General. Lt. Colonel Harriet S. Lee was promoted to the rank of Colonel and Major Agnes P. Snyder to the rank of Lieutenant Colonel.

Major General George E. Armstrong, The Surgeon General, administered the oath of office in the presence of distinguished guests which included the chiefs of the seven components of the Army Medical Service, the chiefs of the Air Force Nurse Corps and Women's Medical Specialist Corps, the directors of the women in the Army, Air Force, Navy and Marines, and representatives from the Federal medical agencies.

Colonel Harriet S. Lee is the new Chief of the Women's Medical Specialist Corps and replaces Colonel Nell Wickliffe now retired. Lt. Col. Agnes Snyder is Assistant to Colonel Lee and Chief of the Physical Therapy Section of the Corps. She replaces Colonel Lee in her former position.

Colonel Lee is immediate past president and currently one of the directors of the American Physical Therapy Association.

A 1923 graduate of Ohio Wesleyan University with a B.A. degree in physical education, Colonel Lee was an instructor in physical education before entering the Army Physical Therapy Course at Walter Reed Army Hospital, Washington, D. C. Upon completion of the course in 1929 she was appointed staff physical therapist there, these positions then being in civilian status. In 1931 Colonel Lee returned to Colorado and in 1934, became associated with the University of Colorado Medical Center, remaining there until 1937 when she accepted a staff position with St. Joseph's Hospital in Denver.

Colonel Lee resumed her professional duties with the Army Medical Service in 1942 at Fitzsimons Army Hospital, Denver, as chief physical therapist. When the Army dietitians and physical therapists were granted relative military rank in March 1943, Colonel Lee was commissioned a Second Lieutenant in the Army of the United States. She was promoted to First Lieutenant by July 1 of that year and became a Captain in February 1945.

In 1946 Colonel Lee was transferred to the Office of The Surgeon General as assistant chief in the Physical Therapy Branch of the Physical Medicine Consultant. Following the establishment of the Women's Medical Specialist Corps in 1947 she was appointed in the Regular Army. She became a Major in 1948.

Returning to Fitzsimons Army Hospital in 1950, Colonel Lee was the chief physical therapist there until she was appointed to her present position in the Office of The Surgeon General with temporary rank of Lieutenant Colonel.

Colonel Lee is a member of Gamma Phi Beta sorority and makes her home in Washington at 1801 Clydesdale Place, N.W. Her daughter, Nancy Talbot Lee, is a student at the University of Idaho, Moscow, Idaho.

Colonel Snyder is a 1932 graduate of Marshall College, Huntington, West Virginia, a 1933 graduate of the Army Physical Therapy Course, Walter Reed Army Hospital, Washington, D. C. and holds a master's degree in physical therapy from the Medical College of Virginia, Richmond. From 1933 until 1943 when physical therapists were commissioned in the Army, Colonel Snyder was in a civilian status, serving at Walter Reed Army Hospital; Sternberg Army Hospital, Manila; Stark General Hospital, Charleston, S. C.; and Ashford General Hospital, White Sulphur Springs, W. Va.

In March 1943 she was commissioned a Second Lieutenant in the Army of the United States and was promoted to the rank of First Lieutenant in July of that year. In January 1944 she was promoted to Captain and in July 1948 to Major.

Colonel Snyder was Physical Therapist Coordinator for the European theatre during 1946 and 1947 when she reported to the Office of The Surgeon General as assistant to the Chief of the Physical Therapy Section of the newly formed Women's Medical Specialist Corps. For her European service Colonel Snyder was awarded the Army Commendation Ribbon.

In October 1949 Colonel Snyder was appointed director of the Physical Therapy Course at Medical Field Service School, Fort Sam Houston, Texas, and remained there until January 1954 when she became chief Physical Therapist at Walter Reed Army Hospital.

Colonel Snyder, whose permanent address is St. Mary's, West Virginia, makes her home in Washington at 1801 Clydesdale Place, N. W.

Courses Offered to Graduate Physical Therapists

At University of Southern California

Announcement has been received of the following courses to be offered at the University of Southern California. Eligibility requirement is graduation from an approved school of physical therapy. Tuition is $20.00 per semester unit. Application should be made to:

Miss Charlotte W. Anderson, Chairman
Department of Physical Therapy
The University of Southern California
Los Angeles 7, California

Workshop on Poliomyelitis (Supported by grant from National Foundation for Infantile Paralysis

Theory and practice in the treatment of the acute and respiratory patient. In affiliation with Los Angeles County General Hospital, C. D. Unit and Rancho Los Amigos Respiratory Center. (4 credit units.)

Dates of Course
January 17 through February 11, 1955
May 2 through May 27, 1955

Hours of Course
9:00 a.m. to 4:30 p.m. daily

Instructors
Jacqueline Miller and Lecturers

Tuition
$80.00 Books: $2.50

Accommodations
Must be arranged individually

Scholarships Available
Contact Division of Professional Education
The National Foundation for Infantile Paralysis
120 Broadway
New York 5, New York

Advanced Dissection Anatomy for Therapists

Dates of Course
June 20 to July 30, 1955

Hours of Course
8:30 a.m. to 12:00 daily

Instructor
Mrs. Roxie Morris

Neurophysiology in the Treatment of Neuromuscular Dysfunction

Understanding and use of reflex mechanisms and sensory stimuli in facilitation of physiologic response. Lecture and Laboratory. (3 credit units.)

Dates of Course
June 27, 1955 through July 15, 1955

Hours of Course
9:00 a.m. to 3:30 p.m. daily

Instructor
Margaret S. Rood

At Children's Hospital

Course on Care of Cerebral Palsy Children

The Children's Hospital, 3700 California Street, San Francisco 18, California, announces a second course supported by United Cerebral Palsy Association for personnel connected with the care of cerebral palsy children to begin on February 1, 1955.

Course Description

Two aspects to program: (1) Training on the growth and development of the pre-school child, and (2) Training on the cerebral palsy pre-school child. Course utilizes existing facilities in the well-child clinics and seminars and demonstrations on problems of growth, development, emotional and social relationships of the pre-school child and his family; provides opportunities for experiences in a cooperative nursery school, with pre-school cerebral palsy program and with cerebral palsy nursery school; seminars and conferences with pediatric, psychiatric and other personnel are held; and there is opportunity

for contacts with parents of cerebral palsy children in the school and through home visits and with public and private agencies concerned with the care of cerebral palsy children.

Dates of Course

February 1, 1955 through June, 1955.

Eligibility

Graduate occupational therapists, physical therapists, and nursery school teachers.

Tuition

Students will receive a stipend of $750.00 during the five months of the training program.

Application forms and information may be obtained from

Miss Helen B. Holodnak, Executive Director
United Cerebral Palsy of San Francisco
Pre-Nursery Program
Children's Hospital
3700 California St.
San Francisco, California

Scholarships for Training in Cerebral Palsy

Scholarship Program

Physicians, therapists, educators, and other professional workers may qualify for scholarships for special study in cerebral palsy provided by Alpha Chi Omega, National Women's Fraternity, and the National Society for Crippled Children and Adults. This scholarship program has been in effect for six years and will continue until September 1955.

Under the scholarship plan, well qualified professional persons will receive graduate training in cerebral palsy. Upon completion of training, they will assist member societies of the National Society and other bona fide agencies serving the cerebral palsied in developing, setting up, and operating facilities and centers for the use of all public and private agencies interested in helping cerebral palsied persons. This is one of several steps in the comprehensive scholarship program of the National Society to help in relieving the shortage of trained specialists needed to treat the hundreds of thousands of persons afflicted with cerebral palsy.

Amount of Grants, Duration and Places of Training

Under the program qualified persons will receive allotments for tuition and maintenance at recognized training centers for a minimum of three months. Grants vary between $100.00 and $750.00. Students are expected to cover their own expenses involved in travel to and from their homes and the center where they will receive their training. Applicants are expected to make their own arrangements for acceptance at an approved training center offering specialized training in cerebral palsy. The National Society will make every effort to assist scholarship candidates in applying to these centers. Applicants who receive awards will be expected to work in some bona fide program for the cerebral palsied for at least one year upon completion of their training and must sign a written agreement to this effect.

Eligibility

The following types of professional workers are eligible to receive scholarships:

1. Doctors, including pediatricians, orthopedists, neurologists, specialists in physical medicine, and other medical specialists.
2. Therapists, including physical therapists, occupational therapists and speech pathologists.
3. Educators, including nursery school teachers, teachers of special education and psychologists.
4. Other needed workers, including nurses, social workers, etc.

Candidates must have completed the required program of training in their own professional fields, and must be fully certified members in good standing of their own professional associations.

How to Apply

Applications for scholarships may be secured from the Training and Employment Service of the National Society for Crippled Children and Adults. Complete data about each candidate's background and any supporting material should be submitted with the application. In addition to the application each candidate must submit a letter describing his interests and objectives in wanting to work with cerebral palsied persons. Information on the proposed course of study, starting date, and duration of course should be included. Candidates must authorize the National Society to secure letters of recommendation from previous employers and to receive transcripts from previous schools attended. Persons who are already registered with the National Personnel Registry and Employment Service may be required to submit new applications in the event that their file is insufficient for consideration under the scholarship program.

For further information address: Training and Employment Service, National Society for Crippled Children and Adults, Inc., 11 South La Salle Street, Chicago 3, Illinois.

Photo Contest Ends This Month

It has been said that of those sights which delight the human eye, one of the most pleasing is to see one's name in print. If this be true, then how much more pleasing is to see a picture of oneself in print.

This experience is a real possibility for physical therapists who enter the "What-Does-a-Physical-Therapist-Do?" photo contest, since many of the entries in this contest will eventually find their way into publicity material about physical therapy.

Of course nothing in the contest rules specifies that you can't take a picture of another physical therapist, if you yourself are lens-shy. You may submit as many pictures as you like, as long as each one is accompanied by an official entry blank, obtainable from the New York office of the American Physical Therapy Association.

It is recommended that each picture illustrate only one answer to the question as to what a physical therapist does. Obviously no one picture could show all the aspects of the profession. Perhaps you may choose to show a physical therapist giving some kind of treatment to a patient in a clinical situation. You may want to photograph a therapist supervising a student PT as he treats a patient. Physical therapy schools also offer unlimited picture possibilities. (After all, one of the things a physical therapist does is to learn his profession.)

In general, photographs are more effective if no more than three persons are shown, though there are of course exceptions to this statement. One of the best ways to get ideas of effective photographs is to leaf through a few copies of one of the popular picture magazines and see for yourself what makes a good picture.

The contest closes December 15, so get your entries in immediately.

Rules for the contest are as follows:

1. Each picture must be accompanied by an official entry blank which includes a publication release form to be signed by individuals pictured (or parents or guardians of such individuals). Entry blanks are available from the American Physical Therapy Association.
2. Physical therapists appearing in the picture must be members of or eligible for membership in the American Physical Therapy Association.
3. All entries must be 5 x 7 black-and-white glossy prints.
4. All entries must include the original negative as well as the print.
5. All entries become the property of the American Physical Therapy Association. None can be returned.
6. The decisions of the judges will be final.
7. Contestants may enter as many pictures as they wish. Each picture must be accompanied by an official entry blank.
8. Entries must be postmarked not later than December 15, 1954.
9. Only pictures which have not been previously published in any form will be accepted.
10. The APTA triangular patch should be clearly visible on the uniform sleeve (right or left) of physical therapists shown. (Students should wear student patch.)

Annual Enrollment Analysis For 1952, 1953, 1954

You who have contributed time and energy to recruit students will be happy to see the upward swing of enrollment in physical therapy programs this fall.

Enrollment	*1952*	*Schools*	*1953*	*Schools*	*1954**	*Schools*
Freshmen	184	13	234	12	313	13
Sophomores	183	13	190	14	328	15
Juniors	223	17	208	16	363	21
Seniors	74	7	202	20	295	25
Certificate	511	26	388	26	361	27
Totals	1,175		1,222		1,660	

*1. Report is based on enrollment of all currently approved Schools (34).

2. Students at Mayo Clinic were tabulated as Juniors (40) and Seniors (29) rather than *certificate* in that it is a two-year program.
3. Students at Puerto Rico were tabulated as Sophomores (12), Juniors (14), and Seniors (16) rather than certificate in that it is a three-year program.
4. Two new programs (Marquette and Oklahoma) are applying for approval this year and have not been included in any tabulations in this report. The enrollment for these two programs are: Freshmen (32); Sophomores (32); Juniors (26); and Seniors (3). No certificate students.

Observations Re Enrollment

35% increase in total enrollment in 1954 over 1953.

10% increase in final year students in 1954 over 1953.

56% increase in students enrolled in degree or more-than-one-year certificate programs. (Mayo and Puerto Rico only certificate programs included).

73% of total enrollment are in degree programs. (Mayo and Puerto Rico excluded in this tabulation).

43% increase in total enrollment in degree programs in 1954 over 1953.

8% decrease in enrollment in one-year certificate programs in 1954 over 1953. (Mayo and Puerto Rico only certificate programs excluded in this tabulation).

Low grade point average and lack of specific admission requirements were the predominant reasons for rejection. Students should be urged to get in touch *early* with the physical therapy director of the school of their choice.

New administration and library building on the Loma Linda campus of the College of Medical Evangelists in California.

College of Medical Evangelists School of Physical Therapy

The College of Medical Evangelists, owned and operated by the Seventh-day Adventist denomination, first began operation as a school of medical evangelism, music, and nursing in 1905. Soon after opening a School of Medicine in 1909, CME became a complete medical education center with eight professional schools.

It now has two large hospitals and outpatient clinics located in Los Angeles and in Loma Linda, which aid in the training of students in schools of Medicine, Nursing, Dentistry, Physical Therapy, Medical Technology, X-ray Technology, and Tropical and Preventive Medicine.

Recognizing the need for trained physical therapists, the Board of Trustees of the College of Medical Evangelists at a meeting early in 1941 authorized the establishment of a School of Physical Therapy to be operated in connection with its School of Medicine and hospitals. The original plan called for the enrollment of ten students every six months. In 1946 this plan was discontinued, and the school now enrolls one class of sixteen students each fall.

The students spend the first six months of their training on the Loma Linda campus of CME in the study of anatomy, kinesiology, physiology, pathology, physics, religion, and the fundamentals of physical therapy. The students then transfer to the White Memorial Hospital on the Los Angeles campus where another six months are spent in the study of massage, therapeutic exercise, muscle reeducation, rehabilitation, muscle grading, body mechanics, cerebral palsy, tests and measurements, fever therapy, occupational therapy, poliomyelitis, surgery, medicine, neurology, psychiatry, psychology, orthopedics, and religion.

During this second six months the students are assigned to various divisions of the Department of Physical Medicine of the White Memorial Hospital for clinical training and experience amounting to 250 hours. Another three months then are spent in obtaining an additional 500 hours of clinical experience at the White Memorial Hospital, Los Angeles County General Hospital, Harbor General Hospital, Rancho Los Amigos, Norwalk State Hospital, Glendale Sanitarium and Hospital, Loma Linda Sanitarium and Hospital, the El Monte and the Washington Boulevard Cerebral Palsy Schools and Patton State Hospital.

Since 1942 the School of Physical Therapy has been approved by the Council on Medical Education and Hospitals of the American Medical Association. Physical therapy schools are now approved by the State of California and graduates are permitted to take the state examinations to qualify as Registered Physical Therapists (R.P.T.) in this state.

During the early years Dr. Clarence Dail was responsible for the organization and operation of the Loma Linda division of the school. Dr. Fred B. Moor, as medical director, has had charge of the work in the Los Angeles division since the opening of the school. During the beginning years the technical directorship was handled by Albert Carlson, B.S.

The present technical director, R. William Berdan, M.A., who is both a graduate nurse and a physical therapist, took over these duties in 1947. At the same time Ethel Manwell, B.S., joined the staff as clinical director of the school. In addition to Dr. Moor, the medical director, and Dr. Dail, the assistant medical director, the school has on its faculty two other diplomates of the American Board of Physical Medicine, Dr. E. C. Christensen and Dr. J. E. Maschmeyer.

From the beginning of the school, both male and female students have been accepted for training. To date 71 men and 61 women have been graduated. There are 13 men and 5 women who will complete their training in December 1954. In the Loma Linda division a class of 7 men and 2 women has just begun training.

Physical Therapy Scholarships

Since 1942 the National Foundation for Infantile Paralysis has appropriated over $2,550,000 for scholarships in physical therapy. For the current year 136 scholarships have been awarded for 30 approved schools of physical therapy.

New Student Members

Albany Hospital

Maxine Allen
Mary Carpenter
Natalie Feitelson
Valerie Harris
Joan Stopielo
Janet Becker
Arlene Faigenbaum
Patricia Golden
Shirley Stockmeyer
Ann Strunk
Carolyn True

Hermann Hospital

Patricia Childs
J. T. Gilbert
Nick Kanakis
Virginia G. Lurton
Diana Nasir
Rex Nutt
Donovan Sessions
Charlotte Stallings
Don Stewart
Harold Woosley, Jr.

Northwestern University

Gale Lillian M. Allen
Gladys Marie Botwinis
Shirley J. Ehlers
Paula Graf
Shirley Hartzell
Allen Hughes
Louise Kilar
Samuel Martino
Sister M. Rita Miller
Marilyn Ott
Betty Taylor
Helen Wales
Pauline Ase
Donna Clausen
Jane F. Flynn
Mary Agnes Hanzo
Janet Holmquist
Carol Jennings
Fay Ann Knickerbocker
Diane McQuilkin
Ted Okita
Julius O. Sutton
Norbert Tokarz
Yvonne Ziadie

University of Buffalo

William V. A. Alexson
Gail Chirnoff
Benedict Kraus
Michael Matlock
Patricia J. Pengeot
Saul Berkoff
Alfred Konsek
Gerald Maroney
Samuel Militello
Barbara Simpson

University of Kansas

Patricia Artman
Dorothy Byler
Charles Chirby
Walter Gault
Raymond Hogue
John Millard
Jack Nitz
Robert Strube
Fern Watts
Mary Lou Bird
Helen Carlson
Billy Elam
Mable R. Gunter
Kathleen Knauss
William Montrastelle
Charlotte Oberst
Martha Vann
Mary Jo Wright

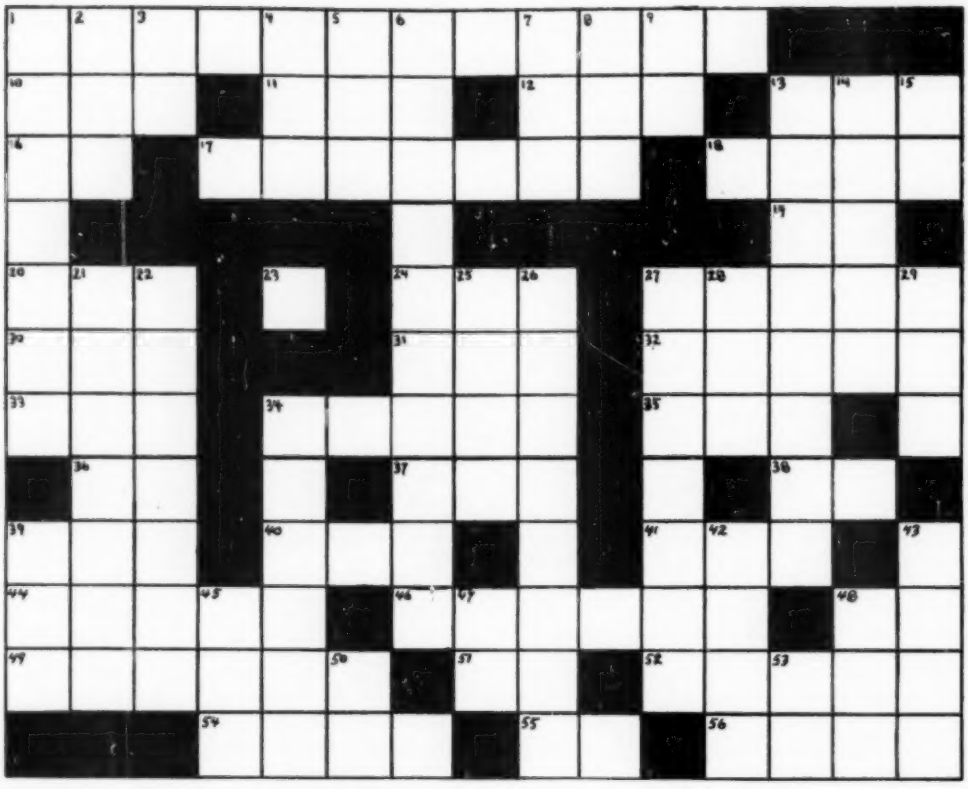
University of Pennsylvania

William Y. Abbot, Jr.
Saraleah B. Cahan
Dorothy Demaria
John M. Duff, Sr.
Betty Garret
Patricia Heckman
Wilmer Loomis, Jr.
Natalie Oshins
Sheldon Saffren
Barbara Ayers
Alfred Daniel
Helaine Dobishinsky
Marta Evosevich
Jan Haltom
Helen Hemphill
Susve Mezick
William Rhoads
Doris Wickel
Charles Wood

Cleft Palate Story

A new movie the *Wisconsin Cleft Palate Story*, in sound and color, has been produced by the Bureau for Handicapped Children, Department of Public Instruction, in cooperation with the University of Wisconsin Medical School, Department of Speech and University Hospitals. It shows the integration of services necessary in the habilitation of a child with cleft palate.

This 36-minute film tells the story effectively and honestly. The film can be rented from the Bureau of Visual Instruction, University of Wisconsin, 1323 West Johnson Street, Madison, Wisconsin, for a nominal fee. It is available for purchase through the Photographic Laboratory, University of Wisconsin Extension Division, 1204 West Johnson Street, Madison, Wisconsin.



Crossword puzzle for physical therapists

Herbert H. Jones

Horizontal

1 A leading School of Physical Therapy
10 Blind impulse
11 Tunisian measure
12 That part of brain known as Mesencephalon
13 Unit of weight (abbr)
16 When this is tight the patient walks on his toes (abbr)
17 Abductor of shoulder
18 Beige
19 Research dosage (abbr)
20 Incorporated in England (abbr)
23 Iliofemoral ligament (abbr)
24 Professor of Sacred Theology (abbr)
27 A faint one never won
30 Medieval short story
31 French cent
32 This nerve supplies a portion of Flexor pollicis brevis
33 Chemists belong to this (abbr)
34 Base line named for Scotch anatomist
35 We are expert when doing this (abbr)
36 Tetanus (abbr)
37 This may be used when exercising
38 Latin bone
39 One of the maters
40 Burmese unit of measure
41 Latin kidney
44 First president of the World Confederation
46 Inserts into the os calcis
48 Ginglymus joint of the hand (abbr)
49 Revise again
51 Ancestor of the Pharaohs
52 Wooden shoe
54 Anatomically speaking this is the end
55 Shown by an EMT (abbr)
56 Larger bone of the anti brachium

Vertical

1 Sesamoid bone
2 Seventh letter of Greek alphabet
3 Chemical symbol—Neon
4 Type of enema (abbr)
5 Lay upside down
6 Inward rotator of humerus
7 French friend
8 To bend
9 Fundamental mass of life tendencies
13 Coal mining town in Pennsylvania
14 More than one leg (Latin)
15 Chemical symbol—Ruthenium

21 One of the senses
22 This causes us a lot of work
25 Ceylon aborigines
26 These lesions respond to ultra violet
27 Funny bone
28 As a cough remedy this is slippery
29 No response, electrically (abbr)
34 Gastric enzyme
39 Each
42 Elder son of Isaac and Rebekah
43 Our organization (abbr)
45 Right occiput anterior position of the fetus (abbr)
47 Surgeon's workshop (abbr)
48 We move this electrically
50 Toxic unit (abbr)
53 Buccolingual (abbr)

The solution of this puzzle will appear in the January Physical Therapy Review.

General News

Girl Scouts Appoint Adviser For Handicapped

Eleanor D. Lloyd has been appointed to succeed Joan L. Carter as Adviser, Scouting for the Handicapped, for the Girl Scouts of the United States of America.

Mrs. Lloyd was transferred from the Public Relations Department of the Girl Scouts to assume the responsibilities for the program for the handicapped, when Miss Carter resigned to return to her position of Director of the Valley Center for Crippled Children in Cango Park, California.

Self-Help Devices for the Arthritic

The Institute of Physical Medicine and Rehabilitation of New York University-Bellevue Medical Center has announced the publication of *Rehabilitation Monograph VI*, "Self-Help Devices For The Arthritic." The 123-page illustrated monograph was written by Edward W. Lowman, M.D. Its publication was made possible by a grant from the New York Chapter, Arthritis and Rheumatism Foundation.

This catalogue is a comprehensive guide to the solution of many of the arthritic's problems in activities of daily living. Special devices in dressing, feeding, writing, and personal hygiene are photographed with illustrations giving the names of manufacturers and stores where they may be purchased. Also depicted are bathroom aids, special beds, wheel chairs, crutches, chairs, utility sticks, and energy-saving devices for use in the home.

The publication is one of a series, entitled, *Rehabilitation Monographs*, dealing with various aspects of rehabilitation and services to the handicapped written by staff members of the Institute. Other titles currently available include: *Rehabilitation Monograph I*, "An Evaluation of Rehabilitation"—a study of 476 cases with a detailed follow-up of 208 cases discharged in 1949 from the Center's Institute of Physical Medicine and Rehabilitation, by Georgia F. McCoy, M.S., and Howard A. Rusk, M.D.; *Rehabilitation Monograph II*, "Psychiatric Aspects of Rehabilitation," by Morris Grayson, M.D., in collaboration with Ann Powers, M.S., and Joseph Levi, Ph.D.; *Rehabilitation Monograph III*, "A Bladder and Bowel Training Program for Patients with Spinal Cord Disease," by Edith Buchwald, M.A., Margaret McCormack, R.N., and Emilie Raby, R.N.; *Rehabilitation Monograph IV*, "Manual of Procedures of the Children's Division, including Objectives, Philosophy, Policies and Staff Functions of the Children's Division of the Institute of Physical Medicine and Rehabilitation"; and *Rehabilitation Monograph V*, "Braces, Crutches and Wheelchairs: Mode of Management." *Monographs IV* and *V* were written by George G. Deaver, M.D. and staff in collaboration with the Association for the Aid of Crippled Children.

Copies of the Monographs are available at $1.00 each from the Institute of Physical Medicine and Rehabilitation, 400 East 34th Street, New York 16, New York.

The Adolescent in Your Family

The Adolescent in Your Family published this week by the Children's Bureau, Department of Health, Education, and Welfare, completes the series of bulletins developed over the years by the Bureau to help parents in their relationships with their children through all the stages of growth.

The Adolescent in your Family is designed as a sourcebook for parents, bringing together for

them the counsel of outstanding experts on the interesting and sometimes troubling years of emergence from childhood to adulthood.

"Pointing out that during the years from 12 to 17 there is more divergence among individuals than in their lives up to that time, the pamphlet makes no attempt to lay down in black and white rules of what is right and what is wrong, or what to do or not to do, either in terms of behavior, or of the correction of behavior," says Dr. Martha M. Eliot, Chief of the Children's Bureau.

"Since the groundwork for a smooth-sailing adolescence is laid years before, it is believed that parents of younger children will find the pamphlet of interest and value also.

"Our purpose, in this bulletin, is to help parents see their maturing children realistically, against the framework of the present day world, rather than through the nostalgic mist of their own pasts. It should be useful for them to know such facts as that youngsters today reach puberty on an average of 2 years earlier than they did 50 years ago, for instance, and that one out of every 4 has an out-of-school job now, whereas in 1940 only one out of 25 combined school and job."

Written by Mrs. Marion L. Faegre, Parent Education Consultant of the Children's Bureau, the 116-page bulletin may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. for 25 cents a copy.

Index to Current Literature

A Preliminary Study of Frustration Reactions of the Post-Poliomyelitic. Leonard V. Wendland, J. Clin. Psychol., X:236-240, July 1954.

Mechanism of Sudden Weakness, Dizziness and Syncope. Edgar E. Poos, J. Aviation Med., 25:284-288, June 1954.

Criteria for the Selection of the Level of Amputation for Ischemic Gangrene. Samuel Silbert and Henry Haimovici, J.A.M.A., 155:1554-1559, August 28, 1954.

Rehabilitation in the Home. Eugene Moskowitz, Postgrad. Med., 16:122-123, August 1954.

Tracheotomy and Bulbar Poliomyelitis. Worthy C. Boden, J. Iowa M. Soc., XLIV: 384-388, August 1954.

Intelligence Test Reliability for Cerebral Palsied Children. David H. Crowell and Doris C. Crowell. J. Consulting Psychol., 18:276, August 1954.

A Parent Training Program for a Cerebral Palsy Unit. Helen J. Levinson, J. Speech and Hearing Disorders, 19:253-257, June 1954.

Cosmetics and Dermatitis. Louis Schwartz, Med. Times, 82:541-550, August 1954.

The School Doctor Considers the Emotionally Troubled Child. Edward R. Cox, Med. Times, 82:536-540, August 1954.

Poliomyelitis Immunization. Curtis Crump, Med. Times, 82:532-535, August 1954.

Peripheral Collateral Circulation Between Cerebral Arteries. Harold Rosegay and Keasley Welch, J. Neurosurg., XI:363-377, July 1954.

Shivering Suppression by Hypothalamic Stimulation. Allan Hemingway, Paul Forgrave and Lucy Birzis, J. Neurophysiol., XVII:375-386, July 1954.

Spontaneous and Induced Activity in Pyramidal Units. I. Calma and A. Arduini, J. Neurophysiol., XVII:321-335, July 1954.

Work-Sampling Applied to the Study of Nursing Personnel. Faye G. Abdellah and Eugene Levine, Nursing Research, 3:11-16, June 1954.

Composition of Skin as Compared with Muscle. MacKenzie Walser and Leonard J. Bodenlos, Am. J. Physiol., 178:91-96, July 1954.

Site of Origin and Velocity of Conduction of Fibrillary Potentials in Denervated Skeletal Muscle. L. W. Jarcho, B. Berman, R. M. Dowben and J. L. Lilienthal, Jr., Am. J. Physiol., 178:129-134, July 1954.

The Medical Approach to the Resettlement of the Disabled. F. S. Cooksey, South African J. Physiotherapy, VIII:4-5, July 1954.

The Habilitation of the Cerebral Palsied Child. F. M. Tragott-Vorwerg and Sophie Levitt, South African J. Physiotherapy, VII:17-19, July 1954.

Special Review. Some Physiological Aspects of Joints in Health and Disease; Part II. Physiology of Abnormal Joints. G. D. Madson, W. A. Selle, and I. W. McKee, Am. J. Phys. Med., 33:239-260, August 1954.

Evaluation of Gamma Globulin Prophylaxis of Poliomyelitis in 1953. Leonard B. Schuman, Illinois Med. J., 106:1, July 1954.

Determination of Human Body Surface Area From Height and Weight. Julius Sendroy, and Louis P. Cecchini, J. Applied Physiol., 7:1-12, July 1954.

How to Teach Students to Write Clearly in Courses Other than English. Marvin J. Barloon, Am. Assn. Univ. Prof. Bull., 39:286-292, Summer 1953.

Early Management of the Injured Hand. Joseph D. Godfrey, J.A.M.A., 155:1484-1486, August 21, 1954.

Rehabilitation of the Hemiplegic Amputee. Abraham O. Posniak, Charles Long II, Michael M. Dacso, and Howard A. Rusk, J.A.M.A., 155:1463-1465, August 21, 1954.

Physical Therapy Programs—1954

APPROVED BY THE COUNCIL ON MEDICAL EDUCATION AND HOSPITALS OF THE AMERICAN MEDICAL ASSOCIATION

DEGREE and CERTIFICATE PROGRAMS—Information on specific entrance requirements should be obtained from the schools listed below. Schools offering a degree will accept high school graduates for the four year program leading to a baccalaureate degree, *as well as transfer students.* A certificate program is a concentrated course of study offered to those who have completed all or most of their undergraduate work before declaring a major in physical therapy. Graduates of either the degree or certificate programs are equally qualified.

	Degree Program	*Certificate Program*
California		
School of Physical Therapy Childrens Hospital Society (Univ. of California at Los Angeles) 4614 Sunset Boulevard Los Angeles 27	†	†
School of Physical Therapy College of Medical Evangelists White Memorial Hospital Boyle and Michigan Avenues Los Angeles 33	†	*
Department of Physical Therapy University of Southern California University Park Los Angeles 7	†	†
Curriculum in Physical Therapy School of Medicine University of California 3rd and Parnassus San Francisco 22	†	†
Division of Physical Therapy Stanford University Stanford	†	†
Colorado		
School of Physical Therapy School of Medicine University of Colorado 4200 East 9th Avenue Denver 7	†	†
Connecticut		
School of Physical Therapy University of Connecticut Box U 101 Storrs	†	
Illinois		
Course in Physical Therapy Northwestern University Medical School 303 East Chicago Avenue Chicago 11	†	†
Iowa		
Department of Physical Therapy State University of Iowa University Hospitals Iowa City		†
Kansas		
Section of Physical Therapy University of Kansas Medical Center 39th and Rainbow Boulevard Kansas City 3	†	†
Louisiana		
School of Physical Therapy Charity Hospital of Louisiana 1532 Tulane Avenue New Orleans 12		†
Massachusetts		
Department of Physical Therapy Boston University Sargent College of Physical Education 6 Everett Street Cambridge 38	†	†
*Course in Physical Therapy Bouve-Boston School Tufts College Medford 55	†	
*Program in Physical Therapy Simmons College The Fenway Boston	†	†
Michigan		
Curriculum in Physical Therapy University of Michigan 1313 East Ann Street Ann Arbor	†	†

*Accepts women students only.

	Degree Program	Certificate Program
Minnesota		
School of Physical Therapy Mayo Clinic 102-110 Second Avenue, S.W. Rochester		†
Course in Physical Therapy 860 Mayo Memorial University of Minnesota Minneapolis 14	†	
Missouri		
Division of Health and Hospital Services St. Louis University 1325 South Grand Boulevard St. Louis 4	†	
Department of Physical Therapy School of Medicine Washington University 660 South Kingshighway St. Louis 10	†	
New York		
•School of Physical Therapy Albany Hospital (Russell Sage College) New Scotland Avenue Albany 8	†	-
Courses for Physical Therapists Columbia University College of Physicians and Surgeons 630 West 168th Street New York 32	†	†
Physical Therapy Division School of Education, New York University Washington Square East New York 3	†	†
Program in Physical Therapy University of Buffalo 2183 Main Street Buffalo 14	†	†
North Carolina		
Physical Therapy Course School of Medicine Duke University Durham		†
Ohio		
Course in Physical Therapy Frank E. Bunts Ed. Inst. Cleveland Clinic Hospital 2020 East 93rd Street Cleveland 6		†
Pennsylvania		
Division of Physical Therapy School of Auxiliary Medical Services University of Pennsylvania 1818 Lombard Street Philadelphia 46	†	†
Division of Physical Therapy The D. T. Watson School of Physiatrics (In affiliation with the University of Pittsburgh) Sunny Hill Leetsdale	†	†
Puerto Rico		
School of Physical and Occupational Therapy Commonwealth of Puerto Rico State Insurance Fund San Juan, P.R.		†
Texas		
Grady Vaughn School of Physical Therapy Baylor University University Hospital Dallas	†	†
Hermann School of Physical Therapy Hermann Hospital 1203 Ross Sterling Avenue Houston 5		†
Division of Physical Therapy University of Texas School of Medicine Galveston	†	†
Virginia		
School of Physical Therapy Baruch Center of Physical Medicine and Rehabilitation Medical College of Virginia 1203 East Broad Street Richmond 19	†	†
Wisconsin		
Course in Physical Therapy Medical School, University of Wisconsin Madison 6	†	†
U. S. Army Medical Service		
•Physical Therapy Course Medical Field Service School Brooke Army Medical Center, Fort Sam Houston, Texas and Brooke, Letterman and Walter Reed Army Hospitals Write to: The Surgeon General Department of the Army Washington 25, D. C. Att: Personnel Division		•

•Accepts women students only.

Please direct all inquiries regarding tuition, entrance requirements and other specific information to the school and *not* to the American Physical Therapy Association.

Abstracts

Pain Associated with Acute Poliomyelitis, Neurologic and Therapeutic Considerations.

Per Bendz, AM. J. DIS. CHILD., 88: 141-147, August 1954.

Pain is a conspicuous symptom in acute poliomyelitis. Besides headache, pain occurs in the trunk and extremities, usually in two episodes during the course of the disease; initially, before motor damage has developed, and later, in the subacute stage, when progression of the disease has more or less ceased and paralysis is present.

The pain is partly spontaneous, in the form of aching, and partly provoked, in the form of tenderness. The aching is both continuous and paroxysmal. The continuous form is felt as an intense irritating pain, mostly resembling postexercise ache or neuralgia. The paroxysmal form consists of brief darting pains, for example, in an extremity as far as the hands and feet. These pains are common in the cranial region too; in the thorax they are felt as stitch-like pains; and in the abdominal region they simulate acute surgical affections. The intense pain gives rise to a marked need of movement, which in the preparalytic stage produces motor restlessness and in the postparalytic stage is invariably a troublesome problem in management of the patient.

Clinical analysis of about 200 cases of poliomyelitis with paralysis of extremities showed that the pain has both a neuralgic and a myalgic element.

The character and distribution of the pain coincide with the symptoms in common root affections, such as herniated disc and acute polyradiculitis.

Poliomyelitis pain, it is accordingly asserted, generally has a radicular genesis, the neuralgic element being referable to the dorsal roots and the myalgic to the ventral roots.

The therapy is symptomatic, and the author advocates caffeine, in particular, as an adequate drug to relieve the neuralgic pain and various local measures, such as local hyperemia or anesthesia, as well as vibration massage, to alleviate the myalgic pain.

For the treatment of acute painful muscle contractures (muscle spasm), the author recommends a simple method consisting in the production of reactive hyperemia after brief arterial stasis by means of a blood pressure cuff, which treatment brings about immediate freedom from pain for muscle extension.

Intrinsic Mechanisms in Periodic Breathing.

H. E. Hoff and C. G. Breckenridge, A.M.A. ARCH. NEUROL. & PSYCHIAT., 72:11-42, July 1954.

The experimental basis for a revised concept of the neurophysiology of breathing recently has been established through the analysis of breathing patterns in a total of more than 350 dogs and 50 cats, studied in the normal unanesthetized state, after a series of transections of the brain stem ranging from hypothalamus to medulla, and before and after vagotomy and the injection of a variety of drugs at each of these levels. In the course of these experiments periodic breathing has appeared almost invariably in one form or another; in nearly a third of all experiments there has developed a clear-cut alternation of breathing and apnea of the general nature of Biot's breathing or Cheyne-Stokes respiration, in circumstances which point clearly to the following explanation of periodic breathing.

Periodicity in breathing is a reflection of an intrinsic slow rhythm of the brain stem normally expressed in deep, all-or-nothing, or gasping breathing.

When the respiratory system is at its lowest functional level of integration, i. e., without any higher-level regulation, breathing is nonperiodic. This is because the fundamental primitive substratum of breathing is nonperiodic.

When the respiratory system is fully integrated, with all levels of supramedullary regulation in operation, from the upper reaches of the medulla to the cortex, breathing is also nonperiodic. This is because with full integration the slow rhythm is suppressed, through balancing of a hierarchy of suppressor and facilitatory systems.

At all levels in between, integration is incomplete, and the intrinsic slow rhythm is more facilitated than suppressed and finds expression in periodic breathing of one kind or another.

Depending on the degree to which suppressor and facilitatory systems are inactivated, a family of respiratory periodicities is created, including Biot's breathing, Cheyne-Stokes respiration, apneustic breathing, and decerebrate breathing.

Such differentiated inactivation with formation of periodic breathing may be produced by anatomical transection, by drugs of central action, by anoxia, by changes in circulation, and by a variety of other physiological and pathological circumstances, including sleep and psychological states.

The Influence of Physical Work upon the Lactic Acid Level in Infective Hepatitis.

A. Mecl, V. Petera, V. Lahn and J. Kubincek. ACTA. MED. SCANDINAV. CXLIX:311-315, July 1954.

Lassitude at work is one of the most common complaints in patients and convalescents after infective hepatitis. In the authors' experience more than 40 per cent of them complain of this trouble. The lassitude lasts very long, sometimes many months, even after all functional tests have become normal.

In this study the authors try to explain the symptom of lassitude by a disturbance of resynthesis of glycogen from lactic acid in the liver. The lactic acid which originates in the working muscle during the inadequate supply of oxygen diffuses out into the blood. The circulating lactic acid is resynthetised by the oxidative routes mainly in the liver.

The authors suggest that in patients suffering from infective hepatitis the liver is not able to turn the lactic acid into glycogen quickly and completely. In this way the lactic acid in the blood remains elevated. This lactic acid is supposed to influence unfavourably the respiration during work and during the recovery period. Thus the efficiency of working is impaired and lassitude sets in.

The metabolism of lactic acid in the acute stage of infective hepatitis and in convalescents was examined after the physical work of 5 kg/kg of body weight. The results were compared with the control group of healthy persons. The lactic acid level in infective hepatitis was much more elevated at the end of the work. The return of the lactic acid curve was delayed. The same curves were found in convalescents. The authors sug-

gest that the disturbed metabolism of lactic acid may be the case of the lassitude of these patients.

Electromyographical Studies in Writer's Cramp.

Gösta von Reis, ACTA MED. SCANDINAV., CXLIX:253-260, July 1954.

The muscle power expended during the act of writing, as estimated by the electromyogram, was studied in 16 normal subjects and 17 subjects with writer's cramp. Seven different muscles in the writing extremity were studied.

The degree of muscle activity in the normal varied from subject to subject. Activity was recorded from the extensors in the forearm and the belly of the brachioradial muscle in every case. In the other muscles activity was less pronounced or insignificant. In a few instances strong activity was recorded from the trapezius muscle. Particularly in the biceps muscle was there little or no activity.

In 8 subjects with writer's cramp strong activity was recorded from all the muscles in the involved extremity. Two of the 8 subjects presented a clinical picture of true mogigraphia with visible contractions of the hand and fingers.

Subjects with writer's cramp show a strong tendency to tense muscles which normally take little or no part in the act of writing. The speed of writing has no demonstrable effect on the electromyographical pattern.

Electromyography is a valuable tool in the differential diagnosis of writer's cramp.

Passive and Active Tension-Length Diagrams of Intact Skeletal Muscle in Normal Women of Different Ages.

Stella Y. Botelho, Leon Cander and Nasser Guiti, J. APPLIED PHYSIOL., 7:93-98, July 1954.

The present study showed that in normal women maximum contractile strength of the adductor pollicis brevis muscle was not attained by the early twenties and a decrease from maximum contractile strength occurred in the years from 51 to 61. These changes in contractile strength were associated with an increase in the stiffness of the nonmuscle tissues as evidenced by the increased slope (T/L) of the passive tension-length curves in the elder women. The authors believe that the decrease in strength of voluntary contraction reported by others is, at least in part, accounted for by a decrease in the muscle/nonmuscle ratio, which results in a stiffer muscle complex.

The contraction period was prolonged and the rate of contraction faster in the isometric single twitches of the elder women. These changes are consistent with an alteration in muscle composition such as an increase in myoglobin, with an alteration in the speed of the chemical reactions of muscle contraction, with an increase in the size of the muscle fibers, with more synchronous contraction of the individual muscle fibers, and with an increase in stiffness of the nonmuscle tissues.

Symptoms of Anxiety and Tension and the Accompanying Physiological Changes in the Muscular System.

P. Sainsbury and J. G. Gibson. J. NEUROL., NEUROSURG., & PSYCHIAT., 17:216-224, August 1954.

In 32 anxious and tense subjects, an inventory was made of their emotions, bodily complaints ascribable to muscular overactivity (headache, backache, etc.) and the incidence rates graphically presented.

These studies indicate that the more the patient experiences tension and anxiety subjectively, the higher the muscle tension. A direct measure of this muscle activity was made by electronically recording the action potentials in two well separated areas, the frontalis and the forearm extensors. There was a positive correlation between the patient's feeling of anxiety and the level of muscle activity recorded from the arm and forehead. There was a significant concordance between muscle activity in the forehead, neck, arm and leg, which suggested that the body musculature as a whole receives increased innervation in patients who are anxious.

The patients were divided into two groups — those whose symptoms scores on the inventory were above and those who were below the median. The muscle tension scores of the former were significantly higher in both the arm and forehead. Those with the most clinical manifestations of anxiety were the most muscularly overactive.

This study is consistent with previous findings that patients with cardiovascular complaints upon exposure to stress, tend to manifest increased physiological responsiveness in the cardiovascular system.

The Elastic Properties of the Anterior Cruciate Ligament of the Rabbit.

J. W. Smith, J. ANAT., 88:369-379, July 1954.

In most current anatomical literature, joint ligaments which do not contain a large proportion of elastic fibers are described as inelastic, and they are sometimes contrasted with structures such as nerve trunks and small arteries which are termed elastic. Clearly, in such descriptions, the term elasticity refers to that property of gross and reversible extensibility in response to small tensile stresses which is characteristic of thin rubber and weak springs. Although this usage is common, the word elasticity also is used to denote a physical property which is only loosely related to the 'springiness' implied by its colloquial use, and it is in this technical sense that the word is used in this communication.

It seems probable, that joint ligaments in common with other predominantly collagenous structures, extend when subjected to load, and that this extension is reversible within certain limits. However, information is incomplete, especially on the relationship of the reaction of a ligament to the duration of the load, and the present investigation was carried out mainly in an endeavour to elucidate this aspect of the problem.

The elastic properties of the anterior cruciate ligament of the rabbit have been studied within 30 minutes of the death of the animal.

The breaking load of the ligament is related to the weight of the animal.

The ligament can be temporarily extended by as much as 20 per cent of its original length.

The ligament is elastic to a load of the order of body weight maintained for 5 minutes.

It is elastic to submaximal loads of short duration.

It reacts as a viscous body to submaximal loads of long duration.

Aftercare of Poliomyelitic Patients.

Earl C. Elkins, POSTGRAD. MED., 16: 137-143, August 1954.

The treatment of the patient who has poliomyelitis is still inadequate; however, disabilities and deformities caused by the disease are not feared so much now as they were at one time. Treatment during the convalescent and chronic stages of poliomyelitis should be supervised from the beginning by a team of workers skilled in the management of skeletal muscular disease in general and poliomyelitis in particular. Responsibility for the care of the patient should be entirely in the hands of physicians, who should make every effort to gain the knowledge necessary for the proper supervision and care of these patients.

It should be further emphasized that all poliomyelitic patients should be examined carefully one to three times a year for several years.

Treatment in poliomyelitis presents an extremely variable problem that has physical, social, and economic facets. Treatment must be highly individualized and adapted to the patient's needs. The poliomyelitic patient is justified in assuming that his physician should be one who has studied the anatomic function of normal muscles, who has seen many forms of paralytic disease and who can apply wisely his knowledge and experience.

Results in In-Flight Testing of SAM Portable Respirator on Poliomyelitic Patients.

Syrrel S. Wilks and Joseph F. Tomashefski, J. AVIATION MED., 25:265-274, June 1954.

At the present time there exists within the military service as well as in civilian life an ever growing need for a reliable portable respirator for short period emergency operation and for transporting completely or partially apneic patients from one location to another, either by ambulance, aircraft, or other conveyance. Present-day commercial facilities for transporting such patients leave much to be desired.

The design and performance of a portable respirator developed by the USAF School of Aviation Medicine has been presented. The respirator will provide adequate ventilation and maximum comfort for all cases of acute or chronically apneic patients. It may also be used as an emergency hospital or medical station unit. Many of the complications of transporting a patient are eliminated.

Shoulder and Arm Pain Associated with Intrinsic and Cervical Lesions.

Joseph A. Freiberg, POSTGRAD. MED., 16:104-110, August 1954.

Shoulder and arm pain may be associated with intrinsic lesions of the shoulder joint, such as calcareous deposits or lesions of the long head of the biceps tendon, or irritation of one or more nerve roots in the lower cervical spine.

Degeneration of the lower cervical disks is a common occurrence in people over 35 years of age. This degenerative process may or may not be associated with lateral protrusion of cervical disk material or osteophyte formation causing nerve root pressure. Intrinsic lesions of the shoulder joint proper may cause a similar arm pain. These lesions are discussed from diagnostic and therapeutic points of view.

Spinal Cord Compression Studies IV. Outlook with Complete Paralysis in Man.

I. M. Tarlov and Ernest Herz, A.M. A. ARCH. NEUROL. & PSYCHIAT., 72: 43-59, July 1954.

Significant recovery of function was not observed after the acute onset of complete sensory and motor paralysis of spinal cord function due to trauma.

However, when the paralysis below the level of the lesion is incomplete immediately after the trauma, almost complete functional recovery may occur, no matter how slight the post-traumatic preservation of function is.

In spite of the uniformly dismal results thus far achieved in treating immediate complete paralysis from acute spinal cord injuries, the results of animal experimentation show that in some cases recovery can occur if the compressive force is removed within a few hours after the accident. This procedure is hedged in by such narrow restrictions of time that it may find a very limited field of usefulness. Nevertheless, it should be carried out in suitable cases in man.

The prognosis in cases of spinal cord tumors followed by gradually increasing and finally complete sensory and motor paralysis is good if the tumor, though it may be malignant, can be completely removed without damaging the spinal cord. Following removal of the tumor in 13 cases, with good recovery, functional recovery began within 9 days after operation in 12 cases and 14 days in the last case.

The longer the interval over which the paralysis occurs, and the shorter the duration of complete paralysis, the sooner does recovery occur after removal of the compressing mass.

The more acute the onset of paralysis in such cases, the more urgent is an immediate attempt to alleviate the condition of the compressed spinal cord.

Histological and Functional Studies on the Fibre Composition of the Vagus Nerve of the Rabbit.

D. H. L. Evans and J. G. Murray, J. ANAT., 88:320-337, July 1954.

After chronic section of the vagus nerve of the rabbit intracranially or extracranially above the nodose ganglion, stimulation of the caudal end of the nerve produces no effect on the heart, larynx, oesophagus or stomach. It is concluded, therefore, that none of the motor fibers in the vagus supplying these structures have their cell bodies in the nodose or jugular ganglia.

The cervical vagus contains about 23,000 fibers, of which only about 2,900 or 13 per cent are medullated. Between 20 and 25 per cent of the total are efferent. Nearly all the large (above 10μ) and from 40 to 50 per cent of the small (below 4μ) medullated fibers are efferent. On the other hand, probably all the medium-size medullated fibers (4-10μ) are afferent.

The branch of the recurrent laryngeal nerve innervating the laryngeal muscles contains large medullated fibers with a sharply unimodal size-frequency distribution. All these fibers degenerate after cutting the vagus above the ganglia and are, therefore, efferent. The probability that the laryngeal muscles of the rabbit are devoid of proprioceptive innervation is discussed.

The thoracic cardiac branches of the vagus are variable in composi-

tion. They contain afferent and efferent fibers of both the medullated and nonmedullated varieties.

The motor functions of the vagus to the bronchial musculature are served by nonmedullated fibers. On the other hand, pulmonary afferent stimuli are conveyed by medullated fibers with a range of diameter between 1 and 12μ and by a few nonmedullated fibers.

The vagus nerves as they enter the abdomen contain about 26,000 nonmedullated fibers, of which probably less than 10 per cent are motor. There are very few medullated (less than 75) present at this level. The abdominal vagus trunks derive their fibers in approximately equal numbers from the right and left cervical vagi.

Poliomyelitis XII. Clinical Evaluation of Hypothalamic Involvement.

Ian A. Brown and Harold Berris, A.M.A. ARCH. NEUROL. & PSYCHIAT., 72:60-72, July 1954.

In bulbar poliomyelitis the hypothalamus shows evidence of microscopic damage in 85 per cent of the cases. Clinical evidence of severe hypothalamic involvement in this disease is manifested by diverse symptomatology, including aberrations in temperature regulation, water metabolism, carbohydrate metabolism, cardiovascular control, and gastrointestinal activity. Since a large number of patients with bulbar poliomyelitis do have definite damage to the hypothalamic nuclei, one would expect many of the recovered patients to show some clinical evidence of such involvement. Unfortunately, there has been no single test or combination of tests which would enable one to adequately evaluate the status of this area of the nervous system.

Little doubt exists that hypothalamic lesions alone are capable of producing endocrine and metabolic changes, but the presence of bulbar and spinal involvement in the same patient renders it impossible to implicate the hypothalamus alone as the responsible source of the observed changes.

A preliminary study is presented in which a battery of 12 tests were used in an attempt to indicate hypothalamic damage in poliomyelitis.

The battery in its present form has limited value as an indicator of hypothalamic damage in poliomyelitis.

The need for a method of clinically evaluating the hypothalamus exists, and the concept of a test battery remains the most applicable at present.

A revised battery is presented.

Simple Physical Therapy in Rheumatic Disease.

Fred B. Moor, POSTGRAD. MED., 16: 144-149, August 1954.

Physical therapy is an important adjuvant in the treatment program of the patient with rheumatoid arthritis. Simple measures which may be employed in the physician's office or the patient's home are heat, massage, rest, and exercise prescribed according to the needs in the individual case.

In degenerative arthritis physical therapy is often the most important part of the treatment program. Heat, massage, rest, and exercise are employed here also. In the author's experience diathermy, properly applied, is the most effective form of heat in osteoarthritis.

In acute bursitis heat in any form usually accentuates pain; therefore, the author has employed a specially prepared ice pack with satisfactory results. In chronic bursitis diathermy and massage are usually effective. In chronic subacromial bursitis mobilization of the shoulder is important.

Acute fibrositis is treated by rest and moist heat, followed by massage as soon as it can be tolerated. In chronic bursitis local diathermy is followed by massage and exercise.

Care of Respiratory Paralysis From Poliomyelitis.

J. F. Marchand, J.A.M.A., 155:1297-1302, August 7, 1954.

The high incidence of deaths due to respiratory involvement of poliomyelitis makes it mandatory to have well planned and efficient treatment programs prepared in advance. The author here sets forth a plan for the acutely ill and convalescent, designed to use decreasing amounts of mechanical respiratory aid, but avoiding relapses or fatalities due to the post-polio respiratory muscle fatigue syndrome. Isolation technics and methods of transporting respiratory patients are discussed.

Following the epidemic emergency there is a real danger that public interest will decrease in relation to the long and costly program that follows. Surviving respiratory patients should be transferred without delay to large regional centers which are both constructed and staffed to meet the needs for prolonged care. A large number of patients with quadriplegic respiratory paresis remain for years in hospitals or homes under expensive arrangements where there is little prospect beyond physical and mental deterioration. Mere custodial management by-passes potentialities for some recovery and reduction in care costs. The education of young long-term patients to a new way of life requires continuing ingenuity for partial replacement of lost physical powers and for restoration of personality structure. The staff required for such convalescent care needs special training, and continuity of personnel and policy is very important.

A comprehensive National Recovery Program for respiratory patients is now urgently needed. More urgent than the need of the patient to return home prematurely is his need for a chance to learn work. This will elevate the individual from a state of vegetative dependency to the dignity and initiative of a productive person.

Biological Significance of Head Posture in Unilateral Disequilibrium.

L. Halpern, ARCH. NEUROL. & PSYCHIAT., 72:160-168, August 1954.

Four cases are presented to illustrate the significance of head posture in the correction of unilateral disturbances of equilibrium. An intentional change in the head posture, depending on the direction of the change, resulted in a systemic improvement or deterioration of the various functions of the patients with sensorimotor induction syndromes. The effects obtained by such alteration of head posture affected systematically the primary sensorimotor phenomena of deviation and the secondary disturbances of sensory perception.

The effect produced operates by means of the neurophysiological mechanism of the Magnus neck reflex. These investigations on man would tend to point out that changed head posture can influence not only motor function but sensory perception as well. The neck reflex appears

in the neurodynamics of unilateral disequilibrium as a regulative factor in that it enters automatically in disturbances of this kind by spontaneous deviation of the head. It appears to aim at creation of a mean position in which the organism can attain its greatest efficiency.

Educational Science in Medical Teaching.

Russell Meyers, J. MED. EDUC., 29: 17-31, August 1954.

In medical schools an academic appointment is a means to an end which does not include teaching as such. An academic post includes such ends as opportunities for research, accessibility to a variety of clinical materials and physical facilities not ordinarily found in non-teaching institutions, enhancement of self-esteem, prestige and authority.

Some of the conspicuous faults in modern medical education include:

(1) an unrealistic concept of motivation. Most educators consider motivation a fait accompli, but under the compartmental system of instruction now in use, much didactic material appears far afield from the practice of medicine and motivation is low.

(2) preoccupation with Psittacotic answers. Mere parrotting of facts does not make the student aware of relationships.

(3) failure to practice the scientific method. This fact is well documented by a critical review of technical articles prepared for publicity in medical journals.

(4) lack of familiarity with the Nature of Perception and the Laws of Learning. It is not generally appreciated that learning is an active process and involves such concepts as discrimination, span of attention, frequency, recency, retention and recall, etc.

(5) imperception of the Roles of Communication and Listening Skills, Group Dynamics and General Semantics in the education process. The better part of science is language and language carries with it potentials for frustration and trouble as well as for adaptation.

Medicine and medical education, however, are now in a period of critical growth. A philosophy of medical education has been evolved which sets forth a clear cut formulation as to its aims. The doctor of the future will be a scientist trained to consider man as a whole human being. The vitality of medical education rests in the ability to understand and transmit this concept.

The Structure and Functions of Fibrocartilages within Vertebrate Joints.

C. H. Barnett, J. ANAT., 88:363-368, July 1954.

Intra-articular fibrocartilages are reinforced by bony lunulae if they are steeply wedged in transverse section.

Fibrocartilages usually occur in those articulations where flexion and extension are associated with gliding, a combination of movements that demands a well-rounded entering surface and a relatively flattened receiving surface. The interposition of a fibrocartilage, the mobility of which is under ligamentous or muscular control, helps to prevent instability of the joint.

In bicondylar joints, gliding movement is usually necessitated by axial rotation. Where axial rotation occurs without gliding, as in the medial half of the knee of the tortoise, no fibrocartilage is present.

In some joints, notably the temporomandibular joint of carnivores, fibrocartilages may reduce the likelihood of attrition of the receiving articular surface by ensuring that a constantly changing region bears the pressure of the entering surface.

Fibrocartilages may also perform the functions of increasing the range of movement at a joint and acting as thrust-pads.

Some Useful Equipment in the Rehabilitation of Permanent Spinal Paraplegics.

Alfred Rothberg, SOUTH AFRICAN JOURNAL OF PHYSIOTHERAPY, VIII: 6-9, July 1954.

Three types of equipment are described and illustrated:

(1) A Trunk Balance Aid in the form of double leg braces, securing the patient to the ground in the standing position.

(2) A Portable Overhead Frame which has been found useful in transferring the patient speedily and safely from the lying to the standing position. Other uses of the frame, especially in the ward, are also described.

(3) Improvised Suspension Slings in the shape of bicycle tubes, as a stand-by in hospitals where proper suspension apparatus is not available.

Our Abstractors for December

Helen J. Hislop
Ila Jane Amrhein

Book Reviews . . . . .

Applied Anatomy and Kinesiology. *By Wilbur Pardon Bowen, M.S. Revised by Henry A. Stone, M.S. 7th Edition. Cloth; price $5.50. Pp. 462; illus. 261, 18 in color. Lea & Febiger, Philadelphia, 1953.*

Wilbur Pardon Bowen's *Applied Anatomy and Kinesiology* has been modernized in this seventh edition by Henry A. Stone to include more general principles of mechanics and neuromuscular physiology and more details of anatomy than its predessesors; but it remains (intentionally so) primarily a text for students of physical education, with a great deal of emphasis on the kinesiology of Sport Skills, and as such is one of the best in this field.

Part I contains general principles of mechanics and neuromuscular physiology. Chapters II, III, and IV on Motion, Torque, Levers, and Equilibrium ought to be helpful to students and teachers of physical therapy for the applications of such physical phenomena. The above muscle actions are indeed difficult to find in most texts of a similar nature. The chapters dealing with neuromuscular physiology, however, are a little inadequate for the physical therapist.

Parts II, III and IV contain the basic anatomy divided into upper extremity, lower extremity, and trunk motions. These sections may serve as a quick guide to physical therapy students but there is not enough detail for a textbook for physical therapists.

Part V entitled General Kinesiology covers such subjects as pos-

ture, walking, running, jumping, games and sports and, most interesting of all, body mechanics of everyday life and occupations.

Bowen's text of *Anatomy and Kinesiology* was always basically sound and Mr. Henry Stone has increased its effectiveness with his changes and additions. Its greatest usefulness will be in the field of physical education.

Betty Lee: The Care of Handicapped Children. *By Charlotte D. Tucker. Price $3.00. Pp. 168. The Macmillan Company. New York, 1954.*

Mrs. Tucker approaches this subject with a background of personal experience including the high hopes, the endless searching, the anguish, and heartache that can only be known by the mother of a handicapped child. Although her daughter's problems were severe mental retardation and lack of speech, the author does not confine herself to these types alone, but discusses handicaps in general—mental, physical, and speech.

It is, in the reviewer's opinion, a book which presents valuable contributions in two very definite areas. First, it should be of help to other parents of handicapped children, not only by aiding the child's adjustment, but by facilitating a better acceptance by the parents. Much stress is placed on recognition by the parents of the fact that their child is handicapped and the importance of an early diagnosis. Once over these two difficult hurdles, a constructive program for correction, based on the nature, extent, and prognosis, should be planned. Many specific suggestions can be found in the chapters on "Morale and Home Environment," "Everyday Problems," and "Poise and Personality." Particular attention should be called to the very sound discussion of "Discipline for the Handicapped."

Second, it is felt that this book could be an effective factor in arousing the conscience of the public concerning its responsibilities to this unfortunate group. The author points out that when society does not understand the handicapped, they are at a double disadvantage, not only fighting against their disability, but also in overcoming the prejudice which surrounds them. Emphasis is placed on the need for community, state, and federal facilities and legislation which will provide a standardization in mental health comparable to that in physical health. This broader program for care of the handicapped, as it pertains to the general public, is discussed in chapters on "The Attitude of Society toward the Handicapped," "Mental Health and Hygiene," "Educational and Vocational Guidance," and "Government Recognition of Child Development."

The book concludes with a rather dramatic presentation "The Children's Charter" as conceived by President Hoover's White House Conference on Child Health and Protection. Following this is a helpful listing of the organizations dealing with the handicapped.

"Betty Lee" is not a textbook nor a reference book, but is a biographical narrative combining personal and general information of interest to anyone dealing with the handicapped.

Modern Concepts of Communicable Disease. *By Morris Greenberg M.D., M.S.P.H. Director, Bureau of Preventible Diseases, New York City Department of Health; Assistant Professor of Epidemiology, Columbia University; Attending Pediatrician, Beth David Hospital; and Anna V. Matz, R.N., M.A., Public Health Nursing Consultant in Communicable Diseases, New York City Department of Health; Lecturer in Communicable Diseases, Willard Parker New York City Department of Hospitals. Cloth. Price $6.20. Pp. 537. Illus. G. P. Putnam and Sons, New York, 1954.*

This book makes one realize how much we take for granted the absence of some of the epidemic diseases that in the past plagued the nations and wiped out small communities. It also makes us realize that only a small part of the world enjoys this comparative safety and that the freedom from some of the epidemics is due to continuous efforts in controlling the environment by means of sanitation immunization and medical treatment. Dr. Greenberg and Miss Matz compiled a wealth of information related to communicable diseases in this book. Workers and instructors in medical fields will find it most helpful and will like the organization of its content.

The book is divided into two parts. The first part gives the historical background of communicable diseases and contains general discussions on infections, resistance, treatment, and medical asepsis. It also describes agencies that are concerned with the control of communicable diseases.

The chapter on history describes the development of concepts of these diseases from primitive times to the present. It describes the progress and developments in bacteriology, sanitation, immunology, epidemiology, and antibiotics. Many changes were made in control measures as new discoveries were made; such as not isolating patients that in the past required isolation, and simplifying isolation technics. The discovery of antibiotics shortened the course of many diseases.

To make the new discoveries effective, national, state and local public health agencies were created to educate the public and to enforce control measures. The United States Public Health Service functions on the national level; it sets up standards for the state and local public health departments, and is responsible for the health of the nation. Other departments in the national government which carry on activities concerned with the control of disease and promotion of health are the Children's Bureau, the Departments of Agriculture, Interior, and Defense. Many voluntary agencies assist in the control, treatment, and research of communicable diseases. Examples of these are the National Tuberculosis Association, The National Foundation for Infantile Paralysis, the Red Cross, and many others.

The second part is the largest portion of the book and gives information on each specific communicable disease. The diseases are divided into four categories based on the mode of transmission: 1. diseases transmitted by respiratory discharges; 2. diseases transmitted by food and water; 3. diseases transmitted by contact; and 4. diseases transmitted by arthropods. There is a general discussion at the beginning of each category on the diseases that fall into that classification, followed by the description of each specific disease. The pattern of discription of each specific disease is the same as in the general discussion and includes: mode of transmission, causitive agent, the host, diagnosis, immunity, environment, control, medical care plan, diet, and supportive nursing care. Although it may seem that there may be repititions, this method gives clarity and saves time when the book is used for reference.

The Principles of Exercise Therapy. *By M. Dena Gardiner, M.C.S.P. Diploma of Bedford Physical Training College; Teacher of the Chartered Society of Physiotherapy; Deputy Principal of London Hospital School of Physiotherapy. Cloth. Price $4.00. Pp. 260; 193 illus. G. Bell & Sons, Ltd., London. Macmillan Co., New York, 1954.*

By education and experience, M. Dena Gardiner is well qualified to write a textbook on the use of exercise for therapeutic purposes. She holds a Diploma in Physical Education and the double teacher's qualification of the Chartered Society of Physiotherapy.

Her book is divided into six parts and an Appendix. Students will find a great deal of valuable information, particularly in Parts III and IV, where technics of mobilizing joints and strengthening muscles are dealt with.

For each major muscle group, *assisted, free,* and *resisted exercises* are described. The material in these parts is well organized and reading is greatly facilitated by generous use of stick figures which are conveniently interspersed in the text. Miss Gardiner must be commended for her painstaking effort in giving detailed descriptions of positions, grips, and manner of execution of the various motions. Mechanical aids, such as sling suspension, springs for resistance as well as for suspension, and weights and pulleys, are well described and clearly illustrated.

In Part IV, 25 pages are devoted to descriptions of some of the original "Swedish Remedial Exercises," as practiced at the turn of the century. They are given with manual resistence, using both shortening and lengthening contractions, and in many instances, are movements involving a number of joints simultaneously, such as hip and knee, or trunk and extremities. For years these exercises have been considered more or less obsolete, but they could stand a reevaluation. Note that they are given with the utilization of "facilitation technics," such as manual resistance and patterns of motion.

In Part I the author had undertaken to discuss mechanical principles, the pelvic tilt, and erect posture, and to analyze muscle action in five fundamental positions (standing, kneeling, sitting, lying, and hanging). In addition, this part contains a section on classification, technic, and effects of movement.

It is no easy task to discuss mechanical principles, such as leverage, composition of forces, equilibrium, elasticity, stresses and strains, as well as the mechanics of motion, and to apply them to human stance and human motion—all in 20 pages. Although a textbook in biomechanics for physical therapists is badly needed, one wonders if a few pages of it has any value in a textbook of this kind? Briefness at the expense of accuracy cannot be recommended.

A number of inaccuracies and questionable statements are found throughout the book. Rising on tiptoes, for example, is used to illustrate leverage of the second order (weight between fulcrum and effort). This arrangement, however, violates the principle of equilibrium which requires that the center of gravity line fall within the base of support. When a subject stands on the toes the center of gravity line cannot fall where indicated on the accompanying drawing—through the ankle joint—since the body would then topple over backward. One need only observe a person rising on tiptoes to see that the body weight is shifted forward before the heels leave the ground.

Part II deals with relaxation and Part V with neuromuscular coordination. Again, these subjects are too large to be squeezed into such a small space.

The author discusses "static" posture in erect standing, as opposed to "dynamic" posture during motion. "Static" posture, it seems to this reviewer, is an inaccurate term, since it has been demonstrated by a number of investigators that erect posture is never static—the body sways continuously in a forward-backward direction and also from side to side.

The analysis of muscle action of erect standing, found in Parts I and V, leaves much to be desired. At no times when specific statements are made, does the author refer to basic investigations of the matters discussed. This is a definite shortcoming throughout the book.

The terminolgy which is used to describe starting positions and motions may at first seem a little strange, perhaps amusing, to the American reader. What is meant, for example by "wrist support stoop kneel sitting" (wr. sup. stp. kn. sitt.), or "half yard grasp high half standing" (½ yd. gr. hi. ½ st.)? These terms and their abbreviations, however, are explained in the Appendix—they are standardized in England and the Scandinavian countries. Once learned, they make for expedience and accuracy in preparing exercise tables.

In summary it may be said that, although Miss Gardiner has nothing essentially new to offer—she makes no claim of originality—the exercise technics which she describes are often excellent. In reading this material one senses that the author draws on a wealth of practical experience in administering therapeutic exercises, and that the technics set forth have been thoroughly tested and found effective. The experienced physical therapist in search of new ideas and a fresh approach, however, will find little inspiration in this publication. It is essentially a student's manual.

Seventy-Five Years of Medical Progress. *Edited by Louis H. Bauer, M.D., F.A.C.P., Secretary-General, The World Medical Association. Past President, The American Medical Association. Cloth. Price $4.00; Pp. 286. Lea & Febiger, Philadelphia, 1954.*

This volume represents the condensed deliberations of the first western hemisphere's conference of the World Medical Association. The theme of this conference was the commemoration and review of 75 years of medical progress. The book relates this progress in a series of 20 chapters covering the major medical specialties and subspecialties with special mention for the field of general practice. The editor's utilization of 19 medical specialties as defined by the Advisory Board for Medical Specialties omitted such recognized areas of specialization as allergy, cardiovascular disease, contagious disease, gastroenterology, neurology, occupational diseases, and pulmonary diseases. New advances, discoveries, drugs, and treatments in these areas are included in a narrative way in the other sections.

Names like Bartemeier, Beecher, Blalock, Compere, DeBakey, Rusk, and Warren among the list of contributors attest to the excellence as well as the unique style of writing and assure the thoroughness with which these medical facts are recorded. The swift and visible growth of medical knowledge together with the increasing tendencies toward medical specialization make the volume a timely one for the reader interested in history.

The editor warns, "even physicians tend to restrict their studies to their own particular field of medical

practice and have only a general knowledge of the outstanding advances of medicine as a whole." His observation is reaffirmed in the life of the average busy physician or specialist, making a book which summarizes the story of the past 75 years in medicine and defines the extent of present day medical knowledge, invaluable to those who read it.

The chapter on general practice written by Dr. Ulrich R. Bryner will be found particularly interesting since he clearly restates the position of the general practitioner versus that of the specialist. He defines the general practitioner in terms of patient need and can be paraphrased in the Toastmaster's word definition of the general practitioner. "He treats what you got," while the specialist says, "You've got what I treat."

The chapter on Physical Medicine and Rehabilitation clearly states the challenge and opportunity for medical service in the fields of chronic disease, disability, and trauma, and is in keeping with present day economic and sociological trends which emphasize the extent of the problem and have made available large sums of public and private monies for physical and vocational rehabilitation for these groups of patients. Dr. Rusk's chapter seems to fulfill Dr. William J. Mayo's prophecy of 25 years ago when he said, "Rehabilitation is destined to become the magic word in medicine."

The chapter on Radiology perhaps most clearly delineates the scope of advances in medicine in the past 75 years with a review of the basic discoveries of the important developments in this medical specialty, which extend from the diagnostic through the therapeutic and into the radio-biological field. The application of the several types of radiation in these areas encompass both improvement in equipment, instrumentation and isotope experimentation.

Each chapter in the book concludes with a terse summary covering historical development to date and expressing hope or prophecies for the future of medicine and the specialty concerned. A short bibliography follows each chapter and is helpful to the reader desirous of further study of a particular subject. The bibliography for the section on thoracic surgery is somewhat longer and represents a rather complete review of the development of this specialty in terms of scientific articles written as each milestone was passed in this particular medical field. Addenda to the book include a list of delegates to the First Western Hemisphere Conference, special guests and guests of honor. The words of the editor in his foreword bear repeating, "Whoever reads this book and integrates the information in its chapters will have before him a complete picture, the picture of contemporary medicine, an account of increasing victories of man in his war against disease."

Thoughts About Life. *By Felix Friedberg. Cloth. Price $2.50. Pp. 40. Philosophical Library, New York, 1954.*

Life has many component parts. In this book of five essays, the author thinks about some of these parts, and the responsibilities to life of education and science. He attempts to underline his basic premise that "every thinking man—not only the scientist—must grope to find his philosophy of life."

The basic points underlined throughout the five essays may be summarized as follows:

1. Each individual is moulded by those around him—the home, school, friends, each contributing to the other's development.
2. Education must induce tolerance, fairness and understanding. There must be a narrowing of the gulf between ideals and reality as it exists in America today. In addition, education (symbolized by the University) must teach that logical critique replace emotional response and that the accumulation of evidence is necessary prior to making judgments. It must teach members to "think straight." New knowledge must be acquired and old knowledge preserved. Ideals should not be discarded in favor of material needs, if the function of a University is to continue.
3. The philosopher and the scientist gain knowledge and ideals from each other, and must understand their relationships to each other. As this understanding improves, the correlation of research will be made more easily.
4. All individuals (including the scientist) must have "faith in ideals towards a better world."

In the last essay "Characteristic Phenomena of Living Things" the author attempts to correlate the above ideas into the "scientific method" as a way of thinking. While the lines of progression are not too clear here, the basic concepts of acquisition of knowledge by preservation and use of old knowledge, logical critique, and understanding are promulgated.

Psychology, The Nurse and the Patient. *By Doris M. Odlum, M.D., Senior Psychiatrist Elizabeth Garret Anderson Hospital, London; Consultant Psychotherapist West End Hospital for Nervous Diseases, London, England. 2nd Edition. Cloth. Price $4.75. Pp. 168. Philosophical Library, New York, and Sanders Phillips & Co. Ltd., London, 1954.*

The stated purpose of the book is to give information required for the licensure examination in nursing. Those in a position to know may feel that the book has fulfilled this purpose. There is a brief review of the various psychological theories, personality development, mental mechanisms, and the psychosoma.

Descriptions of various psychiatric conditions and suggestions for their care are brief and general. The kinds of problems patients have in adjustment to hospital care are vividly described; however, the role of the nurse is not as specific.

The covering of this broad field in a small volume will set some limits for its use in nursing. A reader would probably find it necessary to look further for a more comprehensive discussion of some of the aspects covered.

The reviews here published have been prepared by competent authorities and do not represent the opinions of the American Physical Therapy Association.

For the names of the book reviewers see page 659

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Our Book Reviewers for December

Signe Brunnstrom, Consultant, Kessler Institute of Rehabilitation, West Orange, New Jersey; Consultant Veterans Administration.

Lillian Chabala, Instructor and Supervisor of Directed Practice, University of Southern California, Los Angeles.

Dorothy M. Dean, Chief Physical Therapist, Winnetka Rehabilitation Center, Winnetka, Illinois.

Frances Grover, Tichenor Orthopedic Clinic for Children, Long Beach, California.

Louise Hayward, Consultant Public Health Nurse, Physical Therapy, State of New York Department of Health, Division of Medical Services, Albany.

John H. Kuitert, Lt. Colonel, MC, Chief, Physical Medicine Service, Brooke Army Medical Center, Fort Sam Houston, Texas.

Anne Prochazka, Instructor in Orthopedic Nursing, Vanderbilt University, Nashville, Tennessee.

Classified WANT-ADS

WANTED: Licensed, qualified physical therapist for well equipped hospital and outpatient physical medicine department. Salary dependent on experience. Write: Director, Outpatient Department, Hospital for Joint Diseases, 1919 Madison Avenue, New York 35, New York.

WANTED: PHYSICAL THERAPIST for suburban Philadephia public health nursing agency to give consultant services to staff of 25 nurses and direct services to patients. Salary dependent upon experience. Social security; retirement; 40-hr., 5-day week. Liberal personnel policies. Position open now. Apply Executive Director, Community Nursing Service, Delaware County, 60 S. Lansdowne Ave., Lansdowne, Pa.

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WANTED: QUALIFIED PHYSICAL THERAPIST for outpatient clinic treating multiple sclerosis and allied diseases. Five-day week. Salary schedule designed to attract the best. Good opportunity for research. Contact Gabriel Steiner, M.D., Medical Director, Michigan Multiple Sclerosis Center, 1420 St. Antoine, Detroit 26, Michigan.

(Continued on next page)

Classified WANT-ADS

POSITION: Physical therapist for new cerebral palsy center. If person has had sufficient experience, directorship will be open also. Apply to Mrs. Thomas Owen, Amarillo Cerebral Palsy Center, Amarillo, Texas.

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WANTED: QUALIFIED female physical therapist for preschool cerebral palsied children. Mobile Unit in southeastern Ohio. Therapist with specialized training and experience in field of cerebral palsy preferred. (Scholarship for special training considered for one who lacks same.) Good salary; vacation with pay; station wagon and traveling expenses provided. Forty-hour week. For additional information and application write Miss Grace Roberts, Adm. Director, Cerebral Palsy Treatment Center, 553 E. Town St., Columbus, Ohio.

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WANTED: FOR MOBILE UNIT of Illinois Chapter Arthritis & Rheumatism Foundation, qualified physical therapist. Good salary. Write to: Mrs. Amelia H. Baker, Ex. Director, 79 E. Adams St., Chicago, Ill.

WANTED: PHYSICAL THERAPIST (female) for full or part-time work in orthopedic surgeon's office. Write to Daniel B. Eck, 144 South Harrison Street, East Orange, New Jersey.

WANTED: EXPERIENCED physical therapist (female) for 250-bed hospital and a small well equipped emergency polio center. Good salary; hours from eight to four; paid vacation and sick leave; and Social Security. Definite opportunity for advancement. Apply to Mr. Freeman May, Administrator, Baptist Hospital, Alexandria, Louisiana.

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WANTED: PHYSICAL THERAPIST for 125-bed hospital in Cheyenne, Wyoming. New and active department; 5-day, 40-hour week; vacation and sick leave benefits. Good salary and working conditions. Apply Administrator, De Paul Hospital, Cheyenne, Wyoming.

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